TD
195
.P5
I6
1979

snohomish county planning department · everett, washington · 98201

Property of the Library

INFORMATIONAL NOTEBOOK FOR THE NORTHERN TIER PIPELINE IN SNOHOMISH COUNTY, WASHINGTON

Prepared For:
The Washington State Energy
Facility Site Evaluation Council

Prepared By:
JONES ASSOCIATES, INC
2700 Northup Way
Bellevue, Washington 98004
and
Snohomish County Planning Department

U.S. DEPARTMENT OF COMMERCE NOAA
COASTAL SERVICES CENTER
2234 SOUTH HOBSON AVENUE
CHARLESTON, SC 29405-2413

The preparation of the report was financially aided through a grant from the Washington State Department of Ecology with funds obtained from the National Oceanic and Atmospheric Administration, and appropriated for Section 308 (c) of the Coastal Zone Management Act of 1971. Contract # 79 - 039. December 1979.

TABLE OF CONTENTS

		Page
I.	Background	
	A. Purpose of Pipeline	4
	B. Timing of Development	4
	C. Route Definition and Corridor Location	4
	D. Pipeline Physical Parameters	5
	E. Types of Potential Impacts	7
II.	Physical Environmental Corridor Information and Potential Impacts	
	A. Topography and Geomorphology	10
	B. Environmentally Sensitive Areas and Potential Impacts	12
III.	Cultural Environmental Corridor Information and Potential Impacts	
	A. Land Use	20
	B. County Employment and Demographic Trends	20
	C. Culturally Significant Areas Within Corridor and Potential Impacts	23
IV.	Engineering/Hydrologic Considerations	
	A. Rights-of-Way and Easements for Roads and Utilities	26
	B. Capital Improvement Plans and Relationship to Pipeline Proposal	26
	C. Recommended Minor Alignment Changes	26
V.	Affected Jurisdictions and Potential Impacts	
	A. Municipalities	35
	B. Water and Sewer Districts	36
	C. School Districts	36
	D. Drainage and Diking Districts	36
	E. Other Jurisdictions	36
VI.	Selected Bibliography	38
Appendix A	- Photo Index	43
Appendix B	- Interview Notes	56
Appendix C	- Major and Minor Stream Crossings	61
Appendix D	- Maps	

LIST OF FIGURES AND TABLES

		Page
FIGURES		
FIGURE 1	PROPOSED ROUTE OF NORTHERN TIER PIPELINE THROUGH SNOHOMISH COUNTY	6
FIGURE 2	CROSS-SECTION OF GENERALIZED ELEVATIONS ALONG PROPOSED PIPELINE	11
TABLES		
TABLE 1	HOUSING IMPACTS	22
TABLE 2	NORTHERN TIER PIPELINE EASEMENT AND RIGHT-OF-WAY CROSSINGS IN SNOHOMISH COUNTY	27

I A. PURPOSE OF PIPELINE

The Northern Tier Pipeline Company proposes to construct and operate a pipeline to provide crude oil to the Northern Tier and Upper Midwest States. The pipeline would run from Port Angeles, Washington, to Clearbrook, Minnesota carrying crude oil from Alaska's North Slope as well as imported foreign oil. There is a shortage of crude oil for refineries and users in the Northern Tier and Upper Midwest states due to the recent reduction of Canadian oil exports which they largely depend on. Canada will stop exporting crude oil to the U.S. in 1983. There is a surplus of high-sulfur crude oil at the West Coast refineries because of the abundance of deliveries from Alaska's North Slope oil fields. Construction of the pipeline would facilitate the even distribution of crude oil.

I B. TIMING OF DEVELOPMENT

Construction of the pipeline system is anticipated to begin in 1980. It is expected to take 16 months to construct and be completed by September 1982. As stated in the Draft Environmental Impact Statement:

> The tanker terminal, tank farm, and pipeline system would be constructed at the same time. Pipeline construction would proceed concurrently on each of three sections across the state.
>
> To expand the system to 933,000 barrels per day capacity, seven additional tanks would be constructed at the tank farm and additional pumps installed at existing pump stations. Construction of these facilities would likely begin in February 1984. The expanded system would be operational 19 months later, in September 1985, prior to the anticipated need for additional volume.

I C. THE PIPELINE ROUTE

The proposed Northern Tier Pipeline traverses Snohomish County through a corridor that is approximately 48 miles long. The general

alignment is shown in Figure 1. The pipeline has two basic directional components, one east-west, the other north-south. The east-west component runs from the Island County - Snohomish County line, approximately one mile west of Stanwood, some 12.5 miles to a location two miles north of Arlington. The corridor turns at that point and runs approximately 22 miles in a southerly direction before angling to the southeast as it nears Monroe. From the Monroe area the pipeline runs some 14.5 miles to the King County line.

The pipeline corridor, as proposed, skirts the northern edge of Stanwood but bypasses the city limits of the cities of Arlington, Lake Stevens and Monroe. A two mile wide corridor, one mile on either side of the pipeline, includes all the town of Stanwood and nearly all of Arlington and Lake Stevens. The corridor does not go through Monroe but does include the western half of the Monroe State Reformatory.

I D. PIPELINE PHYSICAL PARAMETERS

The pipeline itself would be 42 inches in diameter and extend 367 miles across the State of Washington. Approximately 48 miles of it crosses Snohomish County. The total pipeline length would be 1,489 miles to Clearbrook, Minnesota.

Initially, the proposed pipeline system would carry 709,000 barrels per day expanding to the ultimate system capacity of 933,000 barrels per day by 1986. A tanker terminal would be constructed at Port Angeles Harbor on Ediz Hook to accommodate large crude oil tankers arriving from Valdez, Alaska. A 242-acre tank farm would be constructed just east of Port Angeles for crude oil storage and be connected to the tanker terminal by a submarine pipeline. From the tank farm, the pipeline would travel under the Straits of Juan de Fuca to Whidbey Island with another submarine stretch crossing the Saratoga Passage to Camano Island. The proposed route enters Snohomish County just west of Stanwood, and proceeds through the County as described above. The pipeline would continue

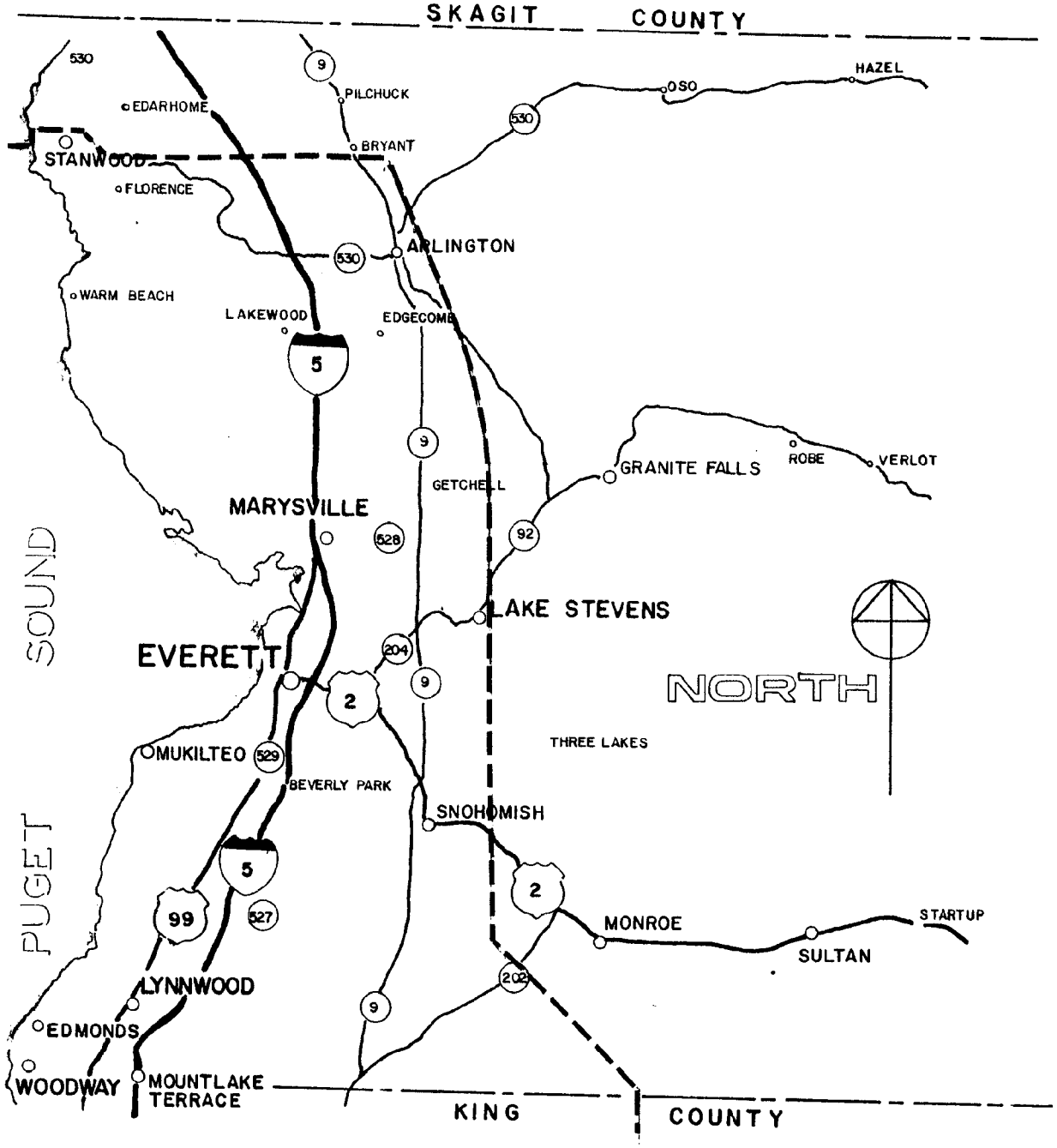


FIGURE 1

PROPOSED ROUTE OF NORTHERN TIER PIPELINE THROUGH SNOHOMISH CO.

south after leaving Snohomish County toward North Bend, where it turns east again, across the Cascade Mountains near Hyak and across the State of Washington.

Throughout the State, the pipeline makes use of 141 miles of existing rights-of-way for powerlines, pipelines and railroads. Approximately 15 major rivers and streams are crossed within the State.

I E. TYPES OF POTENTIAL IMPACTS

The following impacts are summarized from the Draft E.I.S. of the Northern Tier Pipeline System by CH_2M Hill dated November 13, 1979.

Air Quality — There would be temporary degradation of air quality due to construction activities. Long term effects would be minimal from the operation of pump stations along the pipeline route.

Noise — Construction activities would increase noise levels and cause short term impacts. During operation, low level, possibly annoying noise would occur at pump stations.

Topography — Surface terrain will be temporarily disturbed to a minor degree by digging the trenches for the pipeline. Some dense forest areas would be cleared. In mountainous terrain, or bluffs of exposed bedrock, blasting and excavation may permanently alter the topography.

Surface Water — Surface water used for public supplies are not expected to be affected. Temporary siltation problems may occur at stream crossings and marshlands where the pipe is laid. Oil spills in the streams are a possibility.

Ground Water — Many public water supply wells and springs are within the proposed corridor. Oil spills, especially small

undetected leaks, pose the greatest threat to ground water quality. Occasionally, the pipeline would encounter areas of moderate-to-highly permeable soils overlying some shallow water table areas. This risk is considered moderately significant in areas where groundwater is the sole potable source because of the significance of groundwater contamination in these areas.

Flora

Pipeline construction would disturb forest land, pasture, wetlands and riparian areas. Following construction, the right-of-way would be kept clear by mowing or herbicides.

Fauna

In general, the pipeline poses little long term threats to wildlife. Construction in stream beds and wetlands and any major oil spills would reduce some waterfowl populations and alter the marshlands biological ecosystem. Increased sedimentation from construction in salmon streams during egg incubation could temporarily reduce the fishery resource.

Economics, Population, and Housing

Construction of the pipeline would temporarily increase the County's population by 940, about 0.3 percent. During this period housing supply and public services, particularly schools may be strained.

Energy and Utilities

The increased demand for power to construct and operate the pipeline may cause local strain on power supplies. The pipeline would consume less energy than the existing transshipment method serving the Midwest. In a 20 year period, the proposed pipeline would deliver a net total of 34.4 quadrillon BTU's (DOE, 1979).

Recreation

Construction of the pipeline may temporarily disrupt recreational activities along the route.

Risk of Oil Spill, Fire, Explosion, and Hazardous Emissions

An estimated 0.0022 spills per mile per year (or once in 1.3 years) would occur along the pipeline. Land spills would be less serious than water or stream spills. The impacts of these land spills would be dependant on the location, detection time, duration, and success of cleanup. Large-scale pipeline spills are unlikely due to automatic detection and shut-off systems.

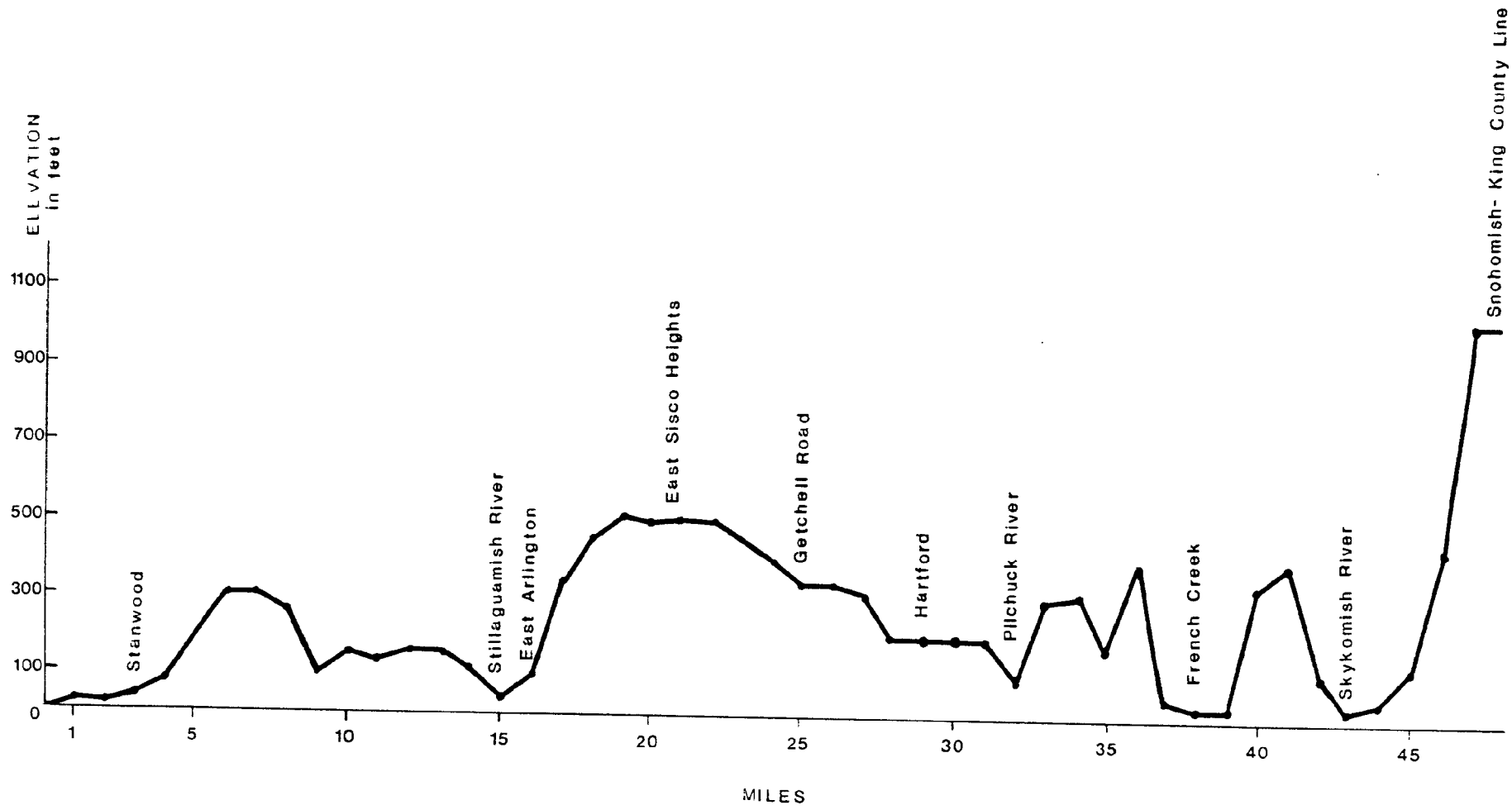
II PHYSICAL ENVIRONMENTAL CORRIDOR INFORMATION AND POTENTIAL IMPACTS

II A. TOPOGRAPHY AND GEOMORPHOLOGY

Topography along the proposed route varies from nearly flat to rolling to extremely steep (over 40 percent slope). Most of the route traverses rolling terrain that contains bogs, marshlands, and small lakes in local depressions. Flat areas are found in river valleys and tide flats. The steep areas are located on the edge of river valleys such as the valleys of the Pilchuck and Skykomish Rivers. Figure 2 shows a cross section of generalized topography along the proposed pipeline corridor. The cross section illustrates the overall topographic irregularity along the proposed corridor. Elevations range from near sea level to over 1,000 feet and tend to vary irregularly as the proposed pipeline moves inland. Photographs in Appendix A illustrate topographic features along the proposed route.

The primary geomorphologic process responsible for the topography along the proposed corridor was glaciation, as it is for the whole of the Puget lowland. Glacial ice, some 2,000 to 3,000 feet thick advanced and retreated into the Puget Sound area at least 4 times. The advances came from the north, and as a result, glacial debris was deposited in a generally north-south alignment with irregular hummocky terrain produced on the uplands. East-west river valleys from rivers originating in the Cascade Mountains interrupt the north-south lineation.

The most important current earth-shaping process in the corridor is the action of rivers. Rivers and streams are dynamic and periodic flooding, along with on-going erosion, modify stream channels unless controlled by channelization or rip-rapping.



Cross Section of Generalized Elevations Along Proposed Pipeline Route

SNOHOMISH CO. WA — NORTHERN TIER STATISTICAL NOTEBOOK - FIGURE 2

II B. ENVIRONMENTALLY SENSITIVE AREAS AND POTENTIAL IMPACTS

Environmentally sensitive areas are those that, because of physical environmental characteristics, can be adversely affected by development. In Snohomish County, environmentally sensitive areas can be divided into those associated with geologic hazards or related to stream crossings.

Geological Hazards

The environmental impact statement for the proposed Northern Tier Pipeline called attention to five types of potential geological hazards along the entire route through Washington State. These hazard areas have the potential for landslides, liquefaction, mudflows, settlement and subsidence. Of these five hazards, only two are noted as present along the corridor in Snohomish County: liquefaction and settlement. In addition, however, landsliding may be present on some river bluffs, especially along the Pilchuk River near Machias.

Liquefaction is a phenomena in which earth materials "liquify" upon seismic shaking. This occurs in areas of sand or silt with a near-surface water table. Two areas along the proposed route are prone to liquefaction: the flood plain/tidal flats around and including the City of Stanwood and a zone near the confluence of the Skykomish and Snoqualmie Rivers. These areas are shown in Plates 29 and 30 of the Northern Tier Pipeline Proposal Draft E.I.S. and underlie about 1.5 miles of the route from the Island County line through Stanwood and about .5 miles of the route southwest of Monroe. The effects of liquefaction during seismic shaking could be significant because without proper preparation the pipeline could be stressed to the point of rupture. Unless shaken, however, no special problems are present.

Settlement can occur in soils with high levels of organic materials or water content such as in muck or swampy ground. Such areas along the route are usually only a few acres in size and occupy local depressions.

[illegible] of geo[illegible] hazard is present in more p[illegible]es than the [illegible] prone areas but the [illegible] distance is less. [illegible] goes [illegible] [illegible]tlement prone [illegible]

[illegible] [illegible]ient [illegible] [illegible]k a[illegible] [illegible] of t[illegible] [illegible]roun[illegible]

[illegible]ngs

There are 9 [illegible] river or stream crossings and over 2[illegible] minor stream [illegible]

[illegible]

3) [illegible]

4) North Fork Stillaguamish River

5) South Fork Stillaguamish River

6) Little Pilchuck Creek

7) Little Pilchuck Creek (second crossing)

8) Pilchuck River

9) Skykomish River

All major and minor stream crossings along the proposed route are named in Appendix C.

Impacts on Surface Waters

The Draft E.I.S. explains surface water impacts to be expected from the construction and operation of an oil pipeline and is included here verbatim.

> Impacts on surface water could result from excavation during construction, from discharge of water used for hydrostatic testing prior to startup, and from possible spills or leaks during operation. The impacts affect the uses of surface water such as public water supply, irrigation, recreation, fisheries, wildlife, and plantlife.
>
> SURFACE WATER MOVEMENT
>
> Temporary diversionary dams may be required in some freshwater streams to allow construction of underwater crossings. They would temporarily redirect the flow of a portion of the streams where this method must be used but would have no lasting effect on water movement.
>
> RUNOFF/ABSORPTION
>
> Removal of the trees and other groundcover along parts of the pipeline route would increase runoff from the cleared area by about 10 percent. The overall impact on streamflow would not be measurable because of the small percentage of the watershed that is altered.
>
> The quality of runoff may be significantly affected. This is further discussed in the section entitled Surface Water Quality.
>
> SURFACE WATER QUANTITY
>
> The proposed project would have no noticeable impact on surface water quantity because runoff would not be measurably increased, nor would water withdrawal for hydrostatic testing be significant.

SURFACE WATER QUALITY

The greatest impact of the proposed project on surface water would be the potential for lowered quality. The impacts on water quality during construction would be different from impacts during operation or abandonment.

Construction Impacts on Surface Water Quality

The primary impact during construction is increased suspended sediment in surface waters due to excavation for underwater pipelines. Some increases in suspended sediment would also occur from erosion after excavation and grading along the pipeline route. Another potential impact during construction results from discharging hydrostatic test water containing harmful chemicals.

The use of surface water for hydrostatic testing of the pipeline and storage tanks would cause two impacts on surface water: withdrawals would slightly reduce streamflows, and materials added to the water during testing could degrade receiving streams upon discharge of the water. Testing the unloading pipelines and storage tanks would require 163 acre-feet of water (at initial capacity). Water would be withdrawn from the Dungeness River.

Materials added to the hydrostatic test water that could change its original quality include bactericides (to be added only if test water is to remain in the pipe for more than 2 months), soda ash (for pH control), and insoluble mill scale, including iron phosphate. Discharging test water would not degrade water quality if the treatment and discharge controls proposed by NTPC are used.

Construction of the pipeline system would cause impacts to both marine and fresh waters. Impacts would primarily be increased suspended sediment levels and the effects of withdrawing and discharging hydrostatic test water.

Construction of the pipeline would increase suspended sediment levels in adjacent freshwater streams. Removing vegetation would increase erosion and allow runoff to carry sediments to streams. In addition to sediments, increased qualities of nutrients and organic compounds would be carried to streams in watersheds where erosion from construction areas is not completely controlled. Increased nutrients and organic loads could slightly degrade water quality by reducing dissolved oxygen levels.

Construction of pipeline stream crossings would also temporarily increase turbidity levels downstream. The magnitude of the impact varies geographically because of the variation in streams and watersheds in Washington.

In the Puget Sound region the pipeline crosses streams in their lower reaches. Existing suspended sediment levels are often high because of runoff from agricultural lands. The increase in suspended sediment levels due to construction of stream crossings is estimated to average 50 mg/l, with instantaneous values as high as 100 mg/l (NTPC, 1979). Sediment would be carried downstream an average of 5 miles. In come cases this would allow sediment to reach marine waters, but in most cases the pipeline crosses streams more than 5 miles above Puget Sound.

Construction in the Cascade Mountains region would involve moderately sloping land that receives large amounts of precipitation. Increases in suspended sediment levels would be high, especially if construction occurs during the rainy months. But its impact on already turbid streams would be less than in summer months. Estimates indicate 100-mg/l increases during instream construction. During average summer flow conditions, sediment would travel up to 7 miles downstream before resettling (NTCP, 1979).

Hydrostatic testing of the pipeline would require withdrawal of water from nearby streams. In the Puget Sound region, withdrawals would reduce streamflow by 1 to 12 percent, depending on the stream and the flow at the time of withdrawal. In the Cascade Mountain region, flows would be reduced 1 to 10 percent.

Discharging test water to receiving streams would not adversely affect water quality if the treatment and flow controls proposed by NTPC are used to remove the chemicals added during testing. Localized, short term impacts would also occur if temperatures of small receiving streams were significantly different from the 50 degrees F to 60 degrees F temperature of the test water.

Operation Impacts on Surface Water Quality

An oil spill in marine waters would significantly degrade water quality. As soon as the oil was released or spilled, spreading, evaporation, emulsification, dissolution, and sedimentation would begin. The volatile hydrocarbons would evaporate rapidly. Soluble hydrocarbons would dissolve and enter the water column. Emulsified oil would probably form a semistable colloid. Tar balls would form. Wind, waves, tides, and currents would aid in spreading these components. While the physical and chemical processes were occurring, biological processes would also be acting on the various components of the original petroleum. These processes would include degradation by microorganisms such as bacteria and uptake by larger organisms (BLM, 1979).

Oil released into the water would exert a biochemical oxygen demand. The dissolved fraction would be estremely toxic to marine life (Clark and Brown, 1977; Ryan, 1977; Vagners and Mar, 1972).

Although large oil spills would cause significant degradation of water quality, the location, areal extent, and duration of the effect would depend on location of the accident, prevailing current and wind, sea conditions, and success of oil spill cleanup. Most significant impacts to water quality caused by toxic compounds would occur immediately after a spill. Longer-term effects would be caused by accumulation of oil along shorelines and in intertidal areas.

Major and minor oil leaks in the pipeline would degrade water quality, especially if these occur near a stream crossing. Based on the proposed location of check valves in the pipeline, the maximum oil spill that could occur because of a pipeline rupture is 64,000 barrels. Minor leaks that could go undetected amount to 0.5 percent of the pipeline capacity or 4,665 (NTPC, 1979) at ultimate capacity. Oil leaks of these magnitudes into streams or rivers would drastically degrade water quality. The degree of degradation would depend on the amount of oil leaked in addition to other factors. Stream flow, velocity, water temperature, and bottom substrate would influence the area impacted, the rate of oil degradation, and the relative toxicity of oil to aquatic life.

In the Puget Sound region and in the Cascade Mountains region, the impacts of a leak would be most severe. Most streams in these regions are classified AA (extraordinary quality). Because the pipeline route in these regions is generally within 20 to 30 miles of Puget Sound, oil spilled at any stream crossing would probably reach the sound. For example, a spill in Dungeness River would reach Dungeness Bay in 2 hours.

Stream Crossings in the Stillaguamish River Basin

Davis Slough and West Pass of the Stillaguamish River are quiet brackish channels carrying water to Port Susan and Skagit Bay. They flow through nutrient rich tidal marsh areas and are designated as Class A (good) water quality and "conservancy" under the Shoreline Master Program. These stream crossings require particular attention with regard to siltation problems from construction due to the fragile ecosystem of the salt marsh. These two channels are also important to four species of salmon which use them for transportation and the adaption of young to salt water during rearing.

Pilchuck Creek is a major tributary of the mainstem of the Stillaguamish River. Pilchuck Creek provides transportation, spawning and rearing for four species for anadromous salmon. It is designated for "conservancy" in the Shoreline Master Program and Class A (good) water quality under the State of Washington Code. Stream bank erosion problems related to road construction and housing projects have caused siltation, loss of shade and habitat and increased water temperatures. Care should be taken to minimize the continuation of these problems during construction.

North Fork Stillaguamish is a major branch draining the north portion of the basin. The lower reaches are designated as Class A water quality and "rural" in the Shoreline Master Program. Siltation and natural low summer flows frequently characterize this reach. Mudslides upstream, and streambed gravel removal occasionally cause severe siltation problems. The North Fork is considered excellent transportation, spawning and rearing habitat for salmon. Sedimentation from the pipeline crossing could have severe but temporary impacts on salmon populations.

South Fork Stillaguamish is the major branch of the south portion of the basin. The affected reaches are designated as Class A water quality and "rural/conservancy" in the Shoreline Management program. The South Fork provides transportation, and fair rearing grounds for salmon. Large earth slides upstream cause siltation and "clogging" of gravel spawning grounds for salmon. Sediment/erosion control measures should be exercised during pipeline construction.

Stream Crossings in the Snohomish River Basin

The Little Pilchuck Creek is tributary to Pilchuck River. It is crossed in two places near the Lake Stevens area by the proposed pipeline route. The creek is designated "rural" in the Shoreline Management Program and Class A by State water quality standards. The creek supports some coho and chum salmon uses. The stream banks are in a good stable condition and care should be taken to restore them after construction.

Pilchuck River is a major tributary of the Snohomish River. Pilchuck River is characterized by its excellent (Class AA) water quality and exceptional juvenile salmon rearing habitat. This river also provides quantities of stream bed gravel, which when removed causes siltation and removal of salmon spawning habitat. The pipeline crossing on the Pilchuck River should be given special consideration because of the significance to fisheries. This is due to the very steep bluff on its left bank which when disturbed by construction could cause serious erosion and runoff problems for the River. The Pilchuck River is designated as "rural/conservancy" by the Shoreline Program and will require extra caution during construction to protect the only Class AA water quality stream crossed in Snohomish County.

The Skykomish River is crossed by the proposed pipeline route outside of the City of Monroe. The river drains agricultural and logging land uses and supports extensive recreational use. Floods, and runoff from logging activities in the Snoqualmie National Forest occasionally degrade its water quality from the existing Class A (good). The Skykomish River provides major transportation for adult and juvenile salmon in the basin. The pipeline crossing point is very wide and will require construction techniques that control erosion and sedimentation.

III CULTURAL ENVIRONMENTAL CORRIDOR INFORMATION AND POTENTIAL IMPACTS

III A. LAND USE

The proposed pipeline corridor goes through a variety of land uses most of which are of a rural character. An analysis of land uses as mapped in the Draft E.I.S. for the Northern Tier Pipeline proposal indicated that nearly 28 miles or 58 percent of the route lies in "forested" land and that about 13 miles or 28 percent of the route lies in "agricultural" land. Cleared forest and rangeland/shrubland make up 2.6 and 1.5 miles respectively or 5 and 3 percent of the corridor. Urban/built-up areas are found along only 2.2 miles or 5 percent of the route and, of this, the majority is found near Stanwood. Water/wetland and miscellaneous categories make up the remaining 1 percent. Photographs in Appendix A illustrate typical land uses along the proposed route.

A major characteristic of the pipeline route is that it either parallels or runs adjacent to existing pipelines or power transmission lines along approximately one-half of the proposed route. The areas of exception are 13 miles of the corridor east from the Island County line to Bryant Lake and the 8 mile stretch west of Monroe to the King County line.

Because land uses along the route are mostly non-urban and represent "passive" uses of land, land use impacts, at least in the short term would be minor. Issues of "consistency" or "compatibility" are apparent only around the few "built-up" areas such as near Stanwood or Lake Stevens. When actual alignments are made, attempts should be made to route the pipeline within or adjacent to existing rights-of-way to lessen the possibility that future growth patterns will be disrupted.

III B. COUNTY EMPLOYMENT AND DEMOGRAPHIC TRENDS AND POTENTIAL IMPACTS

Effects on employment and population will be related to direct employment during construction, which will in turn generate some induced

and indirect employment. Workers and their families moving to the County temporarily could potentially strain housing supply and public services, particularly schools.

Employment Generated: The pipeline will be constructed in Snohomish County between December 1980 and January 1982, with the bulk of the employment generated in September, October and November 1981. During those months, about 275 local workers would be employed, and another 560 workers would come from outside the County (includes direct, indirect and induced labor).

Population and Housing Impacts: The population influx into the County would be concentrated in September-December 1981, when a total of 940 workers and family members are anticipated to locate in the County. This represents about 0.3 percent of the County's projected 1981 population. Housing demand and impact for the peak month is summarized in Table 1, which shows that no severe housing shortages are anticipated.

Temporary increases in population would also result in some increase in demand for public services, especially education. Given the short duration of the influx, the probable spread of families among several towns, and the likely age spread of children anticipated, the impact on any one school system is not likely to be significant.

Increased Tax Revenues

NTPC would pay property taxes to the County during construction and operation of the facilities. Estimated payments are summarized below:

Estimated current tax yield (1978) of pipeline corridor	$ 5,287
Estimated 1981 NTPC tax payments (during construction)	554,251
Estimated 1983 NTPC tax payments (during operation)	539,417

(Source: NTPC, 1979; CH_2M HILL, 1979)

TABLE I

HOUSING IMPACTS

	HOUSING AVAILABLE (No. of Units)	HOUSING REQUIRED, PEAK CONSTRUCTION MONTH (Nov. 1981) (No. of Units)	HOUSING SHORTAGE, PEAK CONSTRUCTION MONTH (Nov. 1981) (No. of Units)
HOTEL/MOTEL			
June-Sept.	160	90	0
Oct.-May	240		
MOBILE HOME	N/A	135	N/A
SINGLE-FAMILY DWELLING	590	105	0
TOTAL			
June-Sept.	750	330	N/A
Oct.-May	830		

N/A - Data not currently available

SOURCE: CH_2H Hill, Inc., 1979

The future (1983) assessed valuation of the NTPC corridor represents about 0.7 percent of the total assessed valuation of the County's 1979 tax base. The increased revenues generated by the pipeline could be used to offset any increased costs incurred by local school districts, although it is likely that the costs would be incurred before substantial increases in revenues materialize. Prepayment of taxes might be considered to help offset this temporary shortfall.

III C. CULTURALLY SIGNIFICANT AREAS WITHIN CORRIDOR AND POTENTIAL IMPACTS

Cultural resource types are discussed in the Draft E.I.S. of the Northern Tier Pipeline as to whether they originated during historic or pre-historic time periods. Historic resources are categorized into those found significant enough to be placed on the National or State Register, are considered to be potentially historic sites, or make up an historic district. Prehistoric "resources" are divided into areas where artifacts have already been found and areas where artifacts may potentially be found.

Few historically significant sites are present near the proposed route. The proposed pipeline route would not displace any historic buildings. Only one site is on the National and State Register. It is the Pearson House in Stanwood, selected for its 1890's architectural merit. The Hartford-Monte Cristo Railroad District near Lake Stevens is also recognized as a cultural-historic resource and is being evaluated for register status. Near Stanwood, pioneer cemetaries are also possible historic sites. An important fact and potential problem, is that information summarized by the NTPL in the Draft E.I.S. is based on existing information and literature. This information concentrates on the areas settled to date. Because most of the proposed pipeline corridor goes through currently rural areas, no formal documentaion exists of locally or regionally historically significant sites. There is no way at this time to determine with certainty whether the proposed pipeline will affect some, as yet unknown historical resource.

Prehistoric resource areas are generally located along streams, around lakes and in river valleys. Known sites within the corridor are located north and south of Stanwood (Section 13 and 26-Range 3 East-Township 32 North) and just east of Lake Stevens (Section 27-Range 6 East-Township 30 North). The proposed pipeline goes through two Sections that are known to contain prehistoric artifacts. These sections are Sections 16 and 21-Township 29 North-Range 6 East.

The proposed route goes through several potentially significant prehistoric areas. Altogether, these potentially significant areas make up 12 miles of the 48 mile route. The principal areas are around Stanwood, east of Arlington, east of Lake Stevens, the French Creek drainage area of the Snohomish River and the area surrounding the confluence of the Snoqualmie and Skykomish Rivers. The latter area is especially important as a recent find has been made in the proposed alternate route at the Sky Meadows Crossing of Indian artifacts, namely points, flakes and choppers.

The pipeline would have few direct impacts on the known historic sites because no historic buildings or sites lie within the right-of-way of the pipeline. It is possible that some, as yet unidentified resource will be adversely affected. Impacts could be significant too, on the existing and potential prehistoric areas. This is because pipeline preparation could destroy artifacts or irrepairably disrupt local stratigraphy. The issue of impacts is made more complex because the prehistoric resources along the pipeline route have not been inventoried through on-site investigation. It is therefore unknown as to the quantity of artifacts that may be present or their significance. Should the pipeline proposal proceed to construction, it will be important to alert the construction crews to the fact that archeologically significant items may be found and the proper procedures to follow in the event artifacts are found. One recommendation that should be considered is to have the proposed route walked by competent historians with thorough local knowledge and archeologists to determine the presence or absence

of historically significant resources or areas with especially high potential for archeologically significant artifacts. Further, for these high-priority areas, a stipulation might be that a competent archeologist accompany the construction crews to assure that artifacts are not destroyed.

IV ENGINEERING AND HYDROLOGIC CONSIDERATIONS

IV A. RIGHTS OF WAY AND EASEMENTS FOR ROADS AND UTILITIES

The proposed pipeline route makes use of approximately 27 miles of existing pipeline, transmission line, and railway easement and right-of-way along the 48 mile section that would traverse Snohomish County. Table 2 details the various rights-of-way and easements intersected by the proposed route, including 40 county rights-of-way or easements and 45 private rights-of-way or easements. In addition, the pipeline would cross state roads at 10 locations, would intersect railway easements at 7 points, and intersects 3 existing pipelines, including the El Paso Natural Gas Company Pipeline, whose route it follows for several miles.

The City of Everett water line, consisting of three 60" diameter pipes, makes use of a 100 foot wide easement which is intersected by the proposed Norther Tier route approximately 1.5 miles southeast of Lake Stevens. Construction plans and related precautionary measures should be scrutinized accordinginly.

IV B. CAPITAL IMPROVEMENT PLANS AND RELATIONSHIP TO PROPOSAL

As far as could be determined, there are no capital improvements planned by any of the adjacent water or sewer districts that might affect the pipeline proposal, or that might be affected by it.

The potential for impacts on road improvement plans should be assessed by analyzing the current six-year Capital Improvements Program for Snohomish County.

IV C. RECOMMENDED MINOR ALIGNMENT CHANGES

As proposed, the northern Tier Pipeline avoids most geologically hazardous areas and, generally, is routed to have the least environmental impact possible. This does not mean that adverse physical or

TABLE 2

NORTHERN TIER PIPELINE EASEMENT AND
RIGHT-OF-WAY CROSSINGS IN SNOHOMISH COUNTY
(Listed North to South on NTP Route)

NAME	OWNERSHIP	R.O.W.	S-T-R LOCATION
SR 532	State	230'	23-32-3
270th St. NW	Local	40'	"
BNRR	Private	50'-70'	"
276th St. NW	Local	50'	24-32-3
BNRR	Private	50'	"
102nd Ave. NW	Local	40'	"
BNRR	Private	50'	"
BNRR	Private	50'	19-32-4
BNRR	Private	450'	"
Cedar Street	Local	80'	"
State Street	Local	70'	"
SR 532	State	170'-215'	"
BNRR	Private	100'	30-32-4
SR 530	State	50'	"
72nd Ave. NW	County	45'	29-32-4
64th Ave. NW	County	120' (cut)	"
36th Ave. NW	Private	60'	27-32-4
Sunday Lake Road	County	50'	26-32-4
12th Ave. NW	County	20'	25-32-4
4th Ave. NW	County	40'	"
Old 99 N.	County	100'	"
Interstate 5	State	350'-400'	"
Dahl Road	County	95'	"
Olympic Pipeline		25'-50'	"
Trans Mountain Oil Pipeline		60'	"

Table 2 continued
Page Two

NAME	OWNERSHIP	R.O.W.	S-T-R LOCATION
5th Ave. NE	Local	70'	30-32-5
7th Ave. NE	Local	30'	"
27th Ave. NE	Local	50'	29-32-5
SR 9	State	50'	27-32-5
BNRR	Private	100'	27-32-5
El Paso Natural Gas* Company Pipeline (NTP follows to Monroe)			26-32-5
Mose Road	County	40'	35-32-5
BNRR	Private	100'	"
SR 530	State	100'	36-32-5
Arlington Heights Road	County	40'	1-31-5
Puget Sound Power & Light Co. - Baker River Transmission Line		100'	"
Bonneville Transmission Line		100'	12-31-5
Tviet Road	Local	40'	12-31-5
97th Ave. NE	Local	40'	13-31-5
Burn Hill Road	County	60'	"
192nd NE	County	25'	18-31-6
190th St. NE	Local	60'	"
Burn Road	County	45'	19-31-6
164th St. NE	Local	30'	30-31-6
Bonneville Transmission Line		25'	"
Seattle City Light Transmission Line		300'	"
Un-named Road	Local	60'	"

* The NTP proposed route parallels the El Paso Natural Gas pipeline through several sections where no other rights-of-way or easement are intersected or paralleled. These are not included in the table.

Table 2 continued
Page Three

NAME	OWNERSHIP	R.O.W.	S-T-R LOCATION
115th Ave. NE	County	40'	31-31-6
148th St. NE	County	25'	32-31-6
124th St.NE	Local	60'	5-30-6
123rd Ave.NE	County	60'	8-30-6
92nd St.	County	40'	20-30-6
84th St. NE (Getchell Rd.)	County/Private	60'	"
68th St. NE	Local		29-30-6
60th St. NE	County	60'	"
129th Ave. NE	Local		32-30-6
"Deeded County Road not built"	County	60'	"
44th St. NE	County	80'	"
127th Dr. NE	Local	60'	5-29-6
SR 92	State	150'	"
131 St Ave. NE	Local	65'	4-29-6
Bonneville Transmission Line		300'	"
137th Ave. NE	Local	30'	"
28th St. NE	County	60'	"
Bonneville Transmission Line			9-29-6
El Paso Natural Gas Pipeline (NTP follows for several miles)			"
Machias - Hartford Road	Local	40'	"
BNRR	Private	100'	"
16th St. NE	County	40'	"
Meridian St.	County	40'	16-29-6
Bonneville Trasnmission Line		150'	"

Table 2 continued
Page Four

NAME	OWNERSHIP	R.O.W.	S-T-R LOCATION
4th Place S.E.	Local	50'	21-29-6
12th S.E.	County	50'	"
Charles St.	Local	60'	"
Division St.	Local	60'	"
Bernard St.	Local	60'	"
Center St.	Local	60'	"
Virginia St.	Local	60'	"
Belner St.	Local	60'	"
Miller St.	Local	60'	"
Railroad Ave. N.	Local	60'	"
BNRR Easement	Private	200'	"
Snohomish-Machias Road	Local	45'	21-29-6
Riviera Blvd.	County	60'	28-29-6
Pilchuck Way	Private	60'	"
Everett Water Line		100'	"
27th St. SE	Private	50'	"
Dubuque Road	County	60'	33-29-6
Three Lakes Rd.	Local	60'	4-28-6
Bonneville Transmission Line		220'	9-28-6
Ohlde Road	Local	60'	"
84th St.	County	30'	16-28-6
Kuhlman Road	County	40'	"
SR2 (Forbes Hill to Westwick Rd.)(Proposed)	State	400'	"
SR 2	State	150'	"

Table 2 continued

Page Five

NAME	OWNERSHIP	R.O.W.	S-T-R LOCATION
"D.D. No.4"		25'	21-28-6
Pacific Northwest Pipeline Corp.		40'	28-28-6
BNRR		100'	"
Puget Sound Power & Light Transmission Line		50'	"
"Drainage Ditch D 4"		50'	"
Monroe Snohomish Rd.	County	60'	33-28-6
139th Ave. SE	Local	30'	"
139th Ave. SE	Local	70'	4-27-6
Un-named cul-de-sac	Local		"
SR 202	State	300'	10-27-6
Testor Road	County	70'	"
190th St. NE	Local	60'	14-27-6
192nd St.SE	Local	25'	"
Tualco Loop	County	40'	23-27-6
Tualco Road	County	60'	24-27-6
SR 203	State	100'	"
Chicago-Milwaukee St. Paul RR	Private	100'	"
High Rock Logging Rd. (Lk. Fontal Rd)	County	40'	"
High Rock Logging Rd.	County	40'	"
195th Ave. SE	Local	50'	"
High Rock Road	County	60'	19-27-7
Rim Rock Road	County	60'	"
Monroe-Sno-King No 1 Easement			30-27-7
Lake Fontal Road	County	50'	"
Spruce Drive	Local	60'	29-27-7

Table 2 continued
Page Six

NAME	OWNERSHIP	R.O.W.	S-T-R LOCATION
Alder Drive	Local	60'	29-27-7
223rd Ave. SE	Local	60'	"
Cherry Garden Road	County	60'	32-27-7
Bonneville Transmission Line		130'	33-27-7

cultural environmental impacts along the route would not occur from pipeline construction or operation. For instance, all minor and major stream crossings are potentially significant in terms of probable or potential impacts to water quality or fisheries.

Following the two basic assumptions that a major leak will not occur and that "best management practices" will be employed during construction, only a few minor alignment changes can be recommended at this time. These are located principally in the Lake Stevens area and near Monroe.

The proposed pipeline is routed around Lake Stevens in Section 4 Township 29N Range 6E. The rationale for not using the existing Olympic Pipeline right-of-way is unclear and warrants consideration. Similarly, in section 9 of the same Township and Range it is unclear as to why the proposed route does not follow the Bonneville powerline right-of-way instead of apparently being routed through a more built-up area. In both these cases, the exact location of the proposed pipeline is not known due to the lack of a precise definition of the pipeline route in the maps provided in the Draft E.I.S. of the Northern Tier Pipeline.

In addition, it is recommended that the pipeline block valve precede the Little Pilchuck Creek crossing near Lake Stevens and a check valve be included after the crossing in Section 4 to minimize the potential for any leaks that might pollute the creek.

In the Monroe area, the most recent revised pipeline alignment appears to affect fewer environmentally sensitive areas. The Olympic Pipeline right-of-way should be followed wherever possible. The major area of concern is in section 15, Township 27N, Range 6E, as the pipeline nears and crosses the Skykomish River. Preliminary archeological investigations at that crossing have found indian artifacts. The potential is high that more will be found because this crossing is near the confluence of the Snoqualmie River and Skykomish River and has, perhaps, the highest

potential for archeologically significant material of area on the proposed route. Further investigations should be undertaken to examine more closely the archeological significance of the area to be traversed by the proposed pipeline before this portion of the line is approved.

Another possible alignment change is about one mile north of the Snohomish-King County line in Section, 32, Township 27N, Range 7E. It appears that one lake is on the route and lies under a power line. A minor alignment change might be considered if on-site investigation indicates that the pipeline would unduly disrupt the long-term quality of the lake.

V AFFECTED JURISDICTIONS AND POTENTIAL IMPACTS

A two-mile wide corridor, the centerline of which is the proposed pipeline route, intersects or closely passes by some twenty-five municipal and special use districts within the bounds of Snohomish County. The approximate limits of these jurisdictions as they are crossed by the corridor are shown in Appendix D.Comment was solicited from the appropriate contact person at each jurisdiction as to potential impacts of the proposed pipeline. When necessary during these conversations, background information and a satisfactory description of the proposal itself was offered and resultant questions were addressed. Refer to Appendix B for a list of individuals contacted and details of the telephone conversations made.

V A. MUNICIPALITIES

Of the six municipalities potentially affected by the pipeline, the cities of Stanwood, Arlington and Lake Stevens are at least partially within the two-mile wide corridor, as it is currently defined. The cities of Snohomish, Marysville and Monroe are outside the corridor, although still in proximity. None of the municipalities contacted was opposed to the pipeline proposal. Each has had previous contact with a representative of NTPC, and was satisfied that the proponent intends to respect jurisdictional priorities. NTPC fully agreed to honor each of the City of Stanwood's requests, including: routing to follow public rights-of- way; "double-ditching" technique to preserve the topsoil; NTPC will pay for the re-construction of some drainage works and tide gates, and will pay for the inspection of these by the city's consultant. Stanwood officials, as a result seemed pleased with the posture taken by the proponent. No specific apprehensions or material objections were revealed in conversations with any of the municpalities.

V B. WATER AND SEWER DISTRICTS

Each of the several water and sewer districts contacted indicated that the proposal should present no obstacles to existing or proposed improvements. The only noteworthy apprehension concerning the proposed pipeline's impact on water and sewer was offered by Mr. C. Stanford Olson, of the Stanwood Water Company, who noted that the city's two spring sources may be vulnerable to an oil spill. Stanwood also maintains four wells, but these are below very impermeable clays and glacial till at depths of 100 to 150 feet.

V C. SCHOOL DISTRICTS

Five school districts are partially within or near the pipeline corridor. None of the respective contact persons had any previous knowledge of the proposal, and the only germaine point of concern was that expressed by Mr. Donald Christianson of Lake Stevens School District # 4, who inquired about the impact upon existing bus routes.

V D. DRAINAGE AND LEVEE DISTRICTS

The proposed corridor does not intersect any of the determinable diking districts now in existence. However, it does include large portions of Drainage District #8, near Lake Stevens, and the French Slough Flood Control District, which includes most of Drainage District #4, near Monroe. No impact of any consequence is foreseen by the respective contact persons.

V E. OTHER JURISDICTIONS

The corridor intersects five fire districts in Snohomish County, only two of which made noteworthy inquiry during telephone conversations. Chief Donald Silcox of Lake Stevens Fire District # 8 stated that while he is not formally opposed to an additional pipeline in his district, he is concerned about the possibility of electrolysis and resultant explosion, should the pipeline be positioned near powerlines. Chief Charles

Walsh of Snohomish Fire District # 4 expressed a concern for and alteration of roadways during construction of the pipeline, but is otherwise not opposed to the project.

Neither of the two county hospital districts contacted made any notable remarks concerning the proposal, and neither could envision any problems associated with it.

Mr. Donald Look, superintendent of the State Reformatory, made no objection to the pipeline proposal.

Mr. R. Reis, of the Snohomish County Public Utility Distict, stated that his organization handled NTPC's proposal no differently than any other formal customer request. The proposal does not present any problems concerning load, etc., and the P.U.D. has agreed to supply power to NTPC in Snohomish County.

VI BIBLIOGRAPHY

INTRODUCTION

This bibliography includes documents related to those concerned with the Northern Tier Pipeline's local impacts and includes:

- methodologies for assessing environmental, economic and social impacts of energy projects
- suggested construction practices and mitigating measures for pipeline construction
- sources of outside assistance to mitigate impacts
- experiences from similar pipeline projects (Alaska, Canada)

The sources included in this bibliography are those which appear to be the most useful documents related to this project, based on our knowledge of probable impacts of energy projects. This list has been compiled from bibliographies in several documents, including:

Washington Energy Facility Site Evaluation Council. 1979. Draft Environmental Impact Statement on the Northern Tier Pipeline System (Washington Segment). Prepared by CH_2M Hill, Inc.

U.S. Department of Interior, Bureau of Land Management. 1979. Final Environmental Statement: Crude Oil Transportation Systems - Northern Tier Pipeline Company and others. Five volumes.

American Society of Planning Officials; Resource and Land Investigations (RALI) Program, U.S. Geological Survey; Office of Research and Development, U.S. EPA. 1979. Onshore Impacts of Outer Continental Shelf Oil and Gas Development II: A Training Project for State and Local Officials.

Energy Abstracts

Environmental Abstracts

Selected Impact Studies for Other Pipeline Projects

BIBLIOGRAPHY

Physical Environmental Impacts

Crabtree, A.F., et al. 1978. The Impacts of Pipeline Construction on Stream and Wetland Environments. Michigan Department of Commerce, Public Service Commission. Lansing, Michigan.

Darnell, R. M., et al. 1976. Impacts of Construction Activities in Wetlands of the United States. Tereco Corp. EPA Office of Research and Development, Corvallis, Oregon.

Hedler, B. 1977. Caring for the Land: Environmental Principles for Site Design and Review. American Society of Planning Officials, Planning Advisory Service, Chicago.

Ingram, D. C. 1978. "Canadian Energy and Environmental Impact." Right of Way, July 1978, pp. 27-31.

Longly, W. L., R. Jackson and B. Snyder. 1978. Managing Oil and Gas Activities in Coastal Environments. U.S. Fish and Wildlife Service, Biological Services Program. FWS/OBS-78/54.

Newkirk, R. T. 1979. Environmental Planning for Utility Corridors. Ann Arbor Science. (U.W. Engineering Library).

Petroleum in the Marine Environment. 1973. Workshop on Inputs, Fates, and the Effects of Petroleum in the Marine Environment.

Review of Environmental Issues of the Transportation of Alaskan North Slope Crude Oil. 1977. Interagency Energy-Environment R & D Program Report, EPA 600/7-77-046.

U.S. Forest Service. Landscape Management Series. Volumes on Roads, Utilities.

Social and Economic Impacts

Impact Studies

Council on Environmental Quality. 1974. OCS Oil and Gas -- An Environmental Assessment, A Report ot the President. Vol. 1. Washington, DC: Government Printing Office.

Research and Planning Consultants, Inc. 1977. Offshore Oil: Its Impact on Texas Communities. Draft, 2 Vols. Austin, Texas.

Impact Assessment Methodology

AbT Associates. 1977. Social Assessment Manual, A Guide to the Preparation of the Social Well-Being Account. Boulder, Colorado: Westview Press.

Braddock, Dunn and McDonald, Inc. 1974. A Methodology for the Analysis of Social Impacts. Vienna, VA: Braddock, Dunn and McDonald, Inc.

Christensen, Kathleen. 1976. Social Impact of Land Development, An Initial Approach for Estimating Impacts on Neighborhood Usages and Perceptions. Washington, DC: Urban Institute.

Herr, P., G. Slater, and R. Bluhm. 1978. Evaluating Development Impacts. MIT Laboratory of Architecture and Planning, ($6.15).

Methodology of Social Impact Assessment. 1977. Finsterbusch Kurt and Wolf C. P., eds. Stroudsburg, PA: Dowden, Hutchinson & Ross, Inc.

Rogers and Golden, Inc. and Allan Mallach Associates. 1977. Economic, Fiscal, and Social Assessment Handbook, Vol. 3, Maryland Major Facilities Study. Prepared for Maryland Department of Natural Resources.

Sanderson-Stinson, Debra, and Michael O'Hare. 1977. Predicting the Local Impacts of Energy Development: A Critical Guide to Forecasting Methods and Models. Cambridge, MA: MIT Laboratory of Architecture and Planning.

Social Impacts Notebook #2. 1975. Prepared by Skidmore, Owings & Merrill and others. Springfield, VA: National Technical Information Service, U.S. Department of Transportation.

U.S. Department of Interior, Bureau of Reclamation. 1977. Economic/Demographic Assessment Manual: Current Practices, Procedural Recommendations, and a Test Case. Prepared by Mountain West Research, Inc.

U.S. Department of Interior, U.S. Fish and Wildlife Service, Environmental Planning for Offshore Oil and Gas. Vol. II. Washington, DC, 1978.

U.S. Environmental Protection Agency, prepared by the National Bureau of Standards, The Social Impact of Noise, Washington DC: U.S. Government Printing Office, Stock #055-000-00047-6, Catalog Number EPI. 2: N69/14. NTID 300.11, $.75. December 31, 1971. 25 pages.

Impact Management Resources

Assistance from Energy Developers: A Negotiating Guide for Communities. 1977. Energy Research and development Administration, Office of Planning, Analysis, and Evaluation. Washington, DC: Government Printing Office.

Managing the Socioeconomic Impacts of Energy Development: A Guide for the Small Community. 1977. Energy Research and Development

Administration, Office of Planning, Analysis, and Evaluation. Washington, DC: Government Printing Office.

National Association of Counties (NACO). Under contract to Federal Energy Administration. Case Studies on Energy Impacts, "No. 5, Serving the Offshore Oil Industry: Planning for Onshore Growth, Northampton County, Virginia," December, 1976; "No. 2, Controlling Boomtown Development, Preparing for Anticipated Growth: Green County, Pennsylvania," May, 1976.

Rapid Growth from Energy Projects: Ideas for State and Local Action, A Program Guide. 1976. Office of Community Planning and Development, Department of HUD. Washington, DC: Government Printing Office, 1976.

Susskind, Larry, and Michael O'Hare. 1977. Managing the Social and Economic Impacts of Energy Development: Stragegies for Facility Siting and Compensating Impacted Communities and Individuals. Cambridge, MA: MIT Laborabory of Architecture and Planning.

Fiscal Impacts

Bish, Robert L. 1976. "Fiscal Effects of OCS Oil and Gas Development and Deepwater Port Development," Coastal Effects of Offshore Energy Systems, Working Paper No. 6 Vol. II, Office of Technology Assessment.

Burchell, Robert W., and David Listokin. 1978. The Fiscal Impact Handbook. New Brunswick: Center for Urban Policy Research, Rutgers University.

Castle, Gilbert H., 1976. III "Evaluating the Impact of a New Community: Saint Charles Communities, Maryland, "Environmental Comment, Urban Land Institute.

Fiscal Impact of Development. 1978. Metropolitan Area Planning Council (Massachusetts).

Roberts, Polly. 1976. "Making Dollars and Sense out of Fiscal Impact Analysis," Environmental Comment, Urban Land Institute.

Williams, David. "State and Local Fiscal Impacts of OCS Activity," paper presented at Coastal Zone Management Conference, San Francisco (March, 1978).

Pipeline Specific Reports

American Petroleum Institute. 1975. Proceedings, 1975 Conference on Prevention and Control of Oil Pollution. Washington, D.C.

Anderson, S., K. Mann, and H. Shugart, Jr. 1976. "The Effect of Transmission Line Corridors on Bird Populations." American Midland Naturalist. 97(1): 216-221.

"Detailed Studies, Strict Criteria Produce Pipeline Earthquake Design." Oil and Gas Journal. November 21, 1977.

Mountain West Research, Inc. 1979. Pipeline Construction Worker Survey and Community Impact Surveys. Prepared for Environmental Research and Technology, Inc. Billings, Montana.

"National Transportation Safety Board Pipe Line Safety Priorities, 1979." Pipeline Industry, June 1979.

Oceanographic Institute of Washington. 1979. Fire and Explosion Hazards: Analysis and Mitigation for the Northern Tier Pipeline Environmental Statement. Seattle, Washington.

APPENDIX A: PHOTO INDEX

#1

West Pass Stillaguamish River taken from the Highway 532 bridge looking northeast, (S23-T32N-R3E). The pipeline will cross this large salt marshland, the river, and adjacent farmland. The potential for disruption of this fragile marine wetland is considerable. This crossing is just west of Stanwood.

#2

West Pass Stillaguamish looking west from Highway 532.

#3

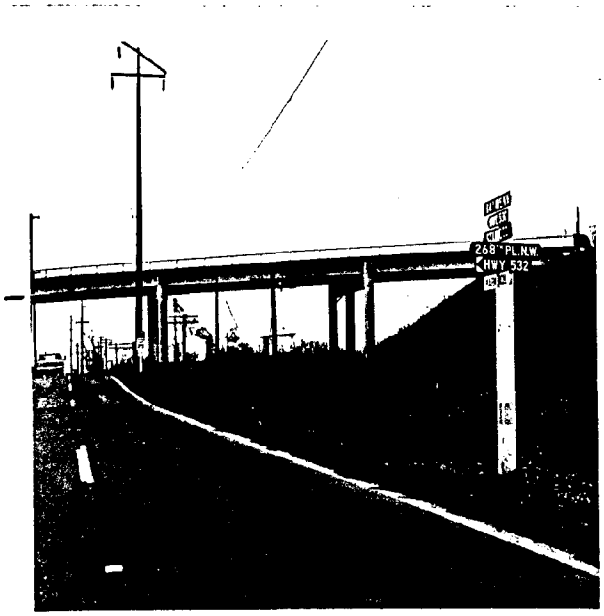
Davis Slough connecting Skagit Bay and Port Susan looking west from Highway 532 (S23-T32N-R3E). The pipeline would cross the slough and adjacent tidal salt marshland possibly disturbing its fragile ecosystem. This crossing is just west of Stanwood at the County line.

#4

276th Street NW and 102nd Avenue NW in Stanwood looking northeast, (S24-T32N-R3E). The proposed pipeline route would use the railroad right-of-way. This type of intersection is characteristic of the majority of road crossings along the route.

#5

102nd Avenue NW in Stanwood looking south from 276th Street NW. This is the northern boundary of the City of Stanwood which the pipeline would travel along. The pipeline would be adjacent to the built-up area of Stanwood, the most urbanized section along the route.



#6

View of Highway 532 bridge in eastern Stanwood at 84th Avenue NW looking north, (S19-T32N-R4E). The proposed pipeline would be crossing Highway 532 in this vicinity heading south, roughly paralleling 84th Avenue NW.

#7

View of the gravel pit north of Sunday Lake. The photo faces west and was taken from Sunday Lake Road, (S26-T32N-R4E). The pipeline would cut through the northern part of this site. These glacial tills and wooded topography are typical of much of the land the pipeline would traverse in Snohomish County.

#8

An open, recently clearcut field east of Sunday Lake. The photo faces southeast from Sunday Lake Road and shows clearcut terrain that will be commonly encountered along the pipeline route. The pipeline would travel west to east through this particular site, (S26-T32N-R4E). Land disturbed by clearcutting is particularly susceptible to erosion problems from pipeline construction. Rolling glacial topography like this is characteristic of the majority of the route.

#9

One-half mile south of the intersection of Highway 532 and Interstate 5 east of Sunday Lake. The pipeline would cross Interstate 5 in this vicinity, (S25-T32N-R4E). The photo is taken from Pacific Highway looking northeast toward the Interstate. The support abutment for Interstate 5 is very large and may cause difficulties for the pipeline crossing.

#10

One-half mile south of the intersection of Highway 532 and Interstate 5 looking west from Pacific Highway. This photo shows the rolling hills and pastureland frequently encountered along the proposed pipeline route.

#11

Pilchuck Creek from Henning Road Bridge (S30-T32N-R5E) looking south. The pipeline would cross Pilchuck Creek just south of where this photo was taken. Pilchuck Creek has good water quality and provides important habitat for salmon. Construction techniques to control erosion and sedimentation should be strictly enforced.

#12

Pilchuck Creek from Henning Road Bridge looking north.

#13

Bryant Lake north of Arlington, (S27-T32N-R5E). The pipeline would pass this kettle lake on the south through surrounding pasture. Any dewatering of trenches and erosion during pipeline construction should be carefully controlled to protect this small lake and surrounding wetland.

#14

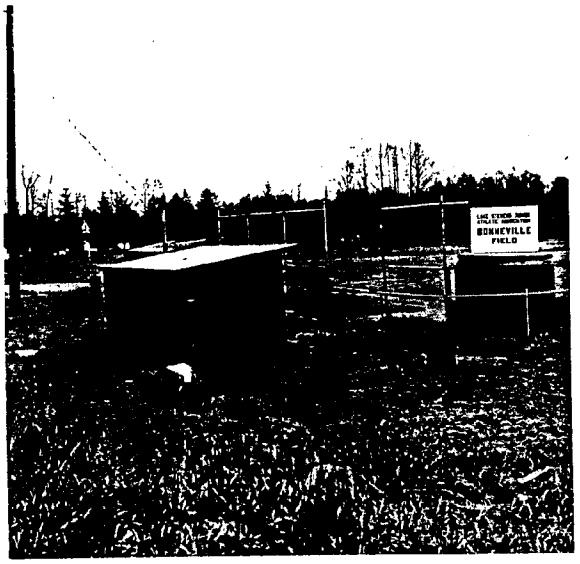
North Fork Stillaguamish River Crossing (S35-T32N-R5E). The photo faces southeast along the corridor of the previously constructed Olympic Pipeline. The proposed Northern Tier Pipeline would cross this river in the same place. The Stillaguamish River occasionally has natural and man-induced siltation problems which interfere with the salmon habitat. Care during construction would prevent acceleration of this problem. These same issues apply to the crossing of the South Fork Stillaguamish River also (S1-T31N-R5E). This route would also cross the railroad right-of-way seen in the foreground and State Route 530.

#15

Existing Olympic Pipeline Corridor crossing Stehr Road southeast of Arlington (S19-T31N-R6E). This right-of-way would be extensively used for the proposed pipeline. The forest and brush along the corridor have been cleared. The photo looks north. The area is boggy with a near surface water table. This condition presents the possibility of settlement and is a significant geological hazard.

#16

Existing Olympic Pipeline Corridor crossing Stehr Road looking south.



#17

Baseball diamond and powerline at the Machias Road and 16th Street NE outside of Lake Stevens. The proposed pipeline would cross Machias Road and the powerline in this vicinity (S9-T29N-R6E). The route through east Lake Stevens goes through an area rapidly urbanizing. The potential for conflicts is high if other than existing rights-of-way are used.

#18

Little Pilchuck Creek from the 16th Street NE bridge (S9-T29N-R6E). Little Pilchuck Creek is a small, fairly pristine creek that has retained its naturally balanced characteristics. Its low flow characteristics make it sensitive to siltation from construction dewatering and bank erosion. Care should be taken to enforce good construction practices. This pipeline crossing is just east of Lake Stevens. The photo looks north.

#19

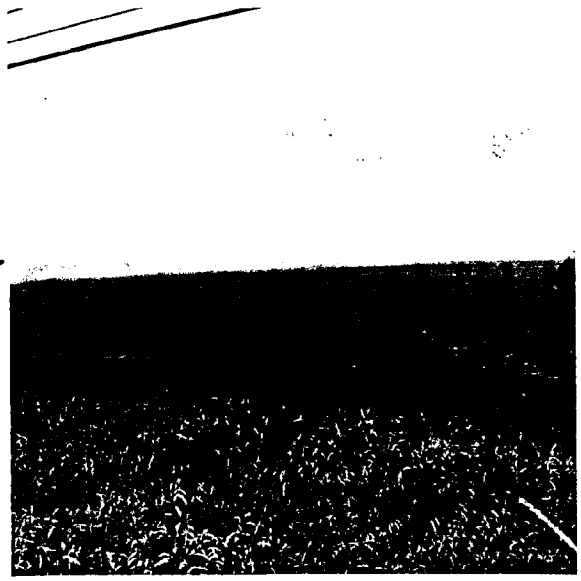
Little Pilchuck Creek from the 16th Street NE bridge, again looking north.

#20

Little Pilchuck Creek from the 16th Street NE bridge looking south.

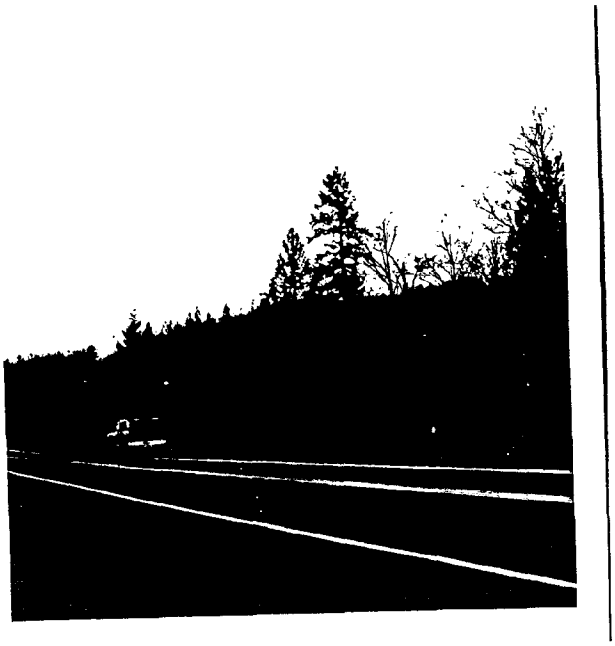
#21

Pilchuck River flows along the base of this bluff near Machias (S28-T29N-R5E). The photo looks south across a pasture land toward the powerline right-of-way. This bluff is approximately 200' high and could cause severe erosion problems when it is crossed during pipeline construction. Pilchuck River is the only Class AA (excellent) water quality crossing encountered and care should be taken to control erosion, dewatering and siltation during construction.



#22

Highway 2 and Westwick Road outside of Snohomish (S21-T28N-R6E). The photo looks southeast across the floodplain of French Creek that the proposed pipeline route will cross. This is typical of agricultural topography frequently encountered along the route. This area is also susceptible to liquefaction.



#23

Highway 2 and Westwick Road looking north just outside of Snohomish where the proposed pipeline route would cross. The highway 2 crossing would be a major right-of-way crossing.

APPENDIX B: CONTACTS

A. Municipalities

NAME	CONTACT PERSON	COMMENTS
City of Stanwood 1022 - 270th NW Stanwood, WA 98292 629-2181 City Hall 629-2650 Mayor	Kenneth E. Day, Mayor Archie Brown, Dr. of Public Works (Until 1/1/80)	Brown has worked with the NTPC to establish acceptable routing and construction methods. NTPC has agreed to mitigating measures: (a) routing to follow public rights-of-way; (b) "double-ditching" technique to preserve topsoil; (c) NTPC to pay for reconstructing some drainage works and tide gates to protect Skagit Bay and Port Susan in an oil spill event; (d) NTPC to pay for inspection of drainage reconstruction by Stanwood's consultant.
City of Arlington City Hall Arlington, WA 98273 435-2515	Howard A. Christenson, Mayor (John Larson, Mayor after 1/80)	No impacts anticipated on Arlington's sewer, water, fire or other services.
City of Snohomish 568-3115	Mr. Smith, City Manager	Mr. Smith did not have enough information to make any comments on the proposal.
City of Monroe 794-4880	Grace Kerwin, Mayor	No objections to pipeline; however, would like further information.
Monroe Planning Dept. 794-7400	Cynthia Pruitt	No impacts anticipated

B. Water and Sewer Districts

NAME	CONTACT PERSON	COMMENTS
Stanwood Water Co. Box 307 Stanwood, WA 98292 62902525	C. Stanford Olson, Owner	The water co. uses 4 wells and 2 springs for water supply. The wells are not likely to be affected because they are deep, and below impermeable clays and glacial till. The springs may be more susceptible to damage from oil spills.
Lake Stevens Sewer Dist. City Hall Lake Stevens, WA 98258 334-1012	Ted Strickland	Mr. Strickland has met with NTPC, does not anticipate any problems.
Monroe Sewer & Water 794-7400	Joe Bredstrand	No impacts anticipated since corridor is outside service area. No capital improvements planned right now.
Snohomish City Sewer & Water 568-3115	Mr. Smith, City Manager	NTPC is outside of service area.

C. School Districts

NAME	CONTACT PERSON	COMMENTS
Stanwood School Dist. # 401 271 st Ave. NW Box 430 Stanwood, WA 28292 629-2766	Robert Larson Superintendent	No effect on school district, however, school board opposes NTPC proposal on environmental grounds

C. School Districts (continued)

NAME	CONTACT PERSON	COMMENTS
Arlington School Dist. # 16 Box 309 Arlington, WA 98223 435-2156	Richard Post, Superintendent	No impacts anticipated,
Marysville School Dist. # 25, 4220 80th N.E. Marysville, WA 98270 659-6261	Dean Farley Ass't. Superintendent	Mr. Farley was not aware of the NTPC proposal, and did not want to comment.
Lake Stevens School Dist # 4 334-4051	Donald Christianson Superintendent	No objections to the pipeline; the only potential impact mentioned was disruption of bus routes.
Snohomish School Dist # 201 568-3151	George Nowadnick Ass't to Superintendent	No objections to pipeline; would like further information.

D. Drainage and Levee Districts

NAME	CONTACT PERSON	COMMENTS
French Slough Flood Control District 568-2850	Dave Bartelheimer	Mr. Bartelheimer was not aware of the pipeline or proposed route; he would like further information before commenting on potential impacts.

E. Other Jurisdictions

NAME	CONTACT PERSON	COMMENTS
Fire Dist. # 24 8420 Boe Rd. Stanwood, WA 98292 652-7876	Stuart Lerrick Chairman	Pipeline presents no problems to Fire District # 14
Fire Dist. # 8 Lake Stevens 334-3034	Don Silcox 259-4070 work 334-3456 home	Only concern is the number of pipelines already in this district There is a potential for electrolysis and explosion because petroleum and gas pipelines (including proposed pipeline) are near power-lines.
Fire Dist. # 4 Snohomish 568-2818	Charles Walsh, Fire Chief	No objections, only concern would be possible alternations to roadways.
Fire Dist. # 3 Monroe	Mr. Stickels Fire Chief	No objections to pipeline.
County Hospital District #3 Casecade Valley Hospital 330 S. Stillaguamish St. Arlington, WA 98223 435-2133	Joe Hopkins Administrator	No impacts on hospital district anticipated.
County Hospital District #1 Valley General Monroe, WA 98272 794-7497	Ross E. Godard, Administrator	Mr. Godard had no previous knowledge of the pipeline, but did feel it would cause any problems.
State Reformatory Monroe 794-8077	Donald Look Superintendent	No impacts anticipated, however, would appreciate receiving more information.

E. Other Jurisdictions

NAME	CONTACT PERSON	COMMENTS
Snohomish County P.U.D. # 1 258-8624	M.H. Stevenson, R. Reis	Mr. Reis has met with NTPC and has made informal agreements concerning NTPC's customer request for electric service in the county. According to Mr. Reis, there is ample power to meet NTPC's request.

F. Unable To Contact

Note: Numerous attempts were made to contact these jurisdictions and contact individuals, however, we have not been able to speak with those listed below.

NAME	CONTACT PERSON
City of Lake Stevens 334-1012	Mayor
Drainage District #8 259-6400	Mr. Morgan
Drainage Districts # 4 and # 4A 794-8957	J. W. Lawler
Fire District # 21 (Arlington) 435-3038	Fire Chief

APPENDIX C: Major and Minor stream crossings and their water quality classification along proposed pipeline route in Snohomish County.

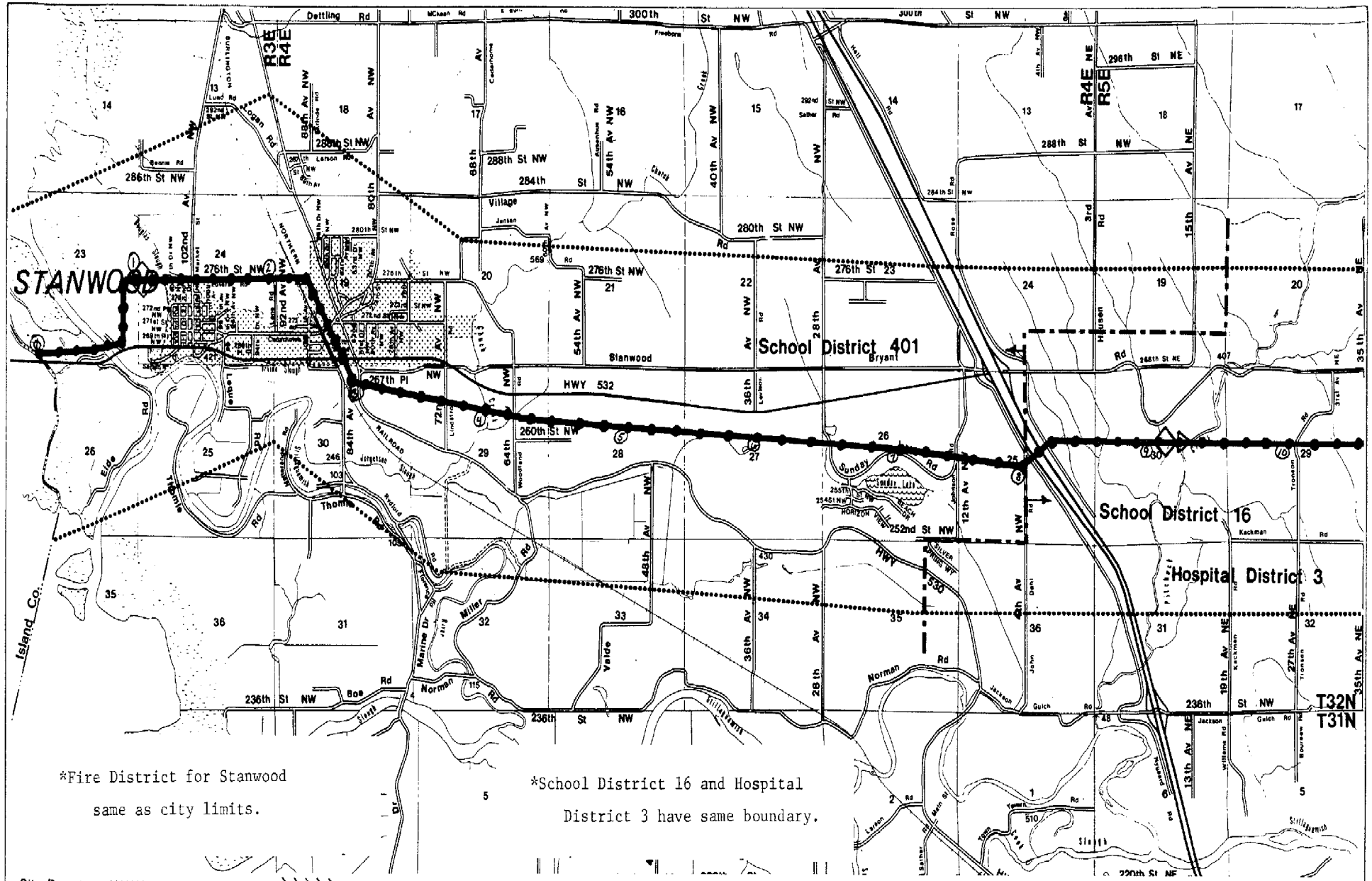
Stream Name	Number	Location
Davis Slough	1	23 - 32 - 3
West Pass	2	23 - 32 - 3
Douglas Slough	3	24 - 32 - 3
Church Creek (first)	4	29 - 32 - 4
Church Creek (second)	5	29 - 32 - 4
Unnamed Creek	6	27 - 32 - 4
Unnamed Creek	7	26 - 32 - 4
Unnamed Creek	8	25 - 32 - 4
Unnamed Creek	9	25 - 32 - 4
Unnamed Creek	10	25 - 32 - 4
Unnamed Creek	11	30 - 32 - 5
Unnamed Creek	12	30 - 32 - 5
Pilchuck Creek	13	30 - 32 - 5
Unnamed Creek	14	29 - 32 - 5
Unnamed Creek	15	27 - 32 - 5
Armstrong Creek	16	26 - 32 - 5
N. Fork Stillaguamish R.	17	35 - 32 - 5
S. Fork Stillaguamish R.	18	01 - 31 - 5
Unnamed Creek	19	13 - 31 - 5
Unnamed Creek	20	30 - 31 - 6
Little Pilchuck Creek (first)	21	32 - 31 - 6
Star	22	17 - 30 - 6
Unnamed Creek	23	32 - 30 - 6
Little Pilchuck (second)	24	04 - 29 - 6
Little Pilchuck (third)	25	09 - 29 - 6
Catherine Creek	26	09 - 29 - 6
Pilchuck River	27	28 - 29 - 6
Unnamed Creek	28	09 - 28 - 6
Unnamed Creek	29	09 - 28 - 6

Stream Name	Number	Location
French Creek	30	21 - 28 - 6
Unnamed Creek	31	28 - 28 - 6
Unnamed Creek	32	33 - 28 - 6
Unnamed Creek	33	33 - 28 - 6
Unnamed Creek	34	03 - 27 - 6
Riley Creek	35	14 - 27 - 6
Unnamed Creek	36	24 - 27 - 6
Peoples Creek	37	19 - 27 - 6
Unnamed Swamp	38	32 - 27 - 7

Source: Snohomish County Planning Department
Data Base: USGS

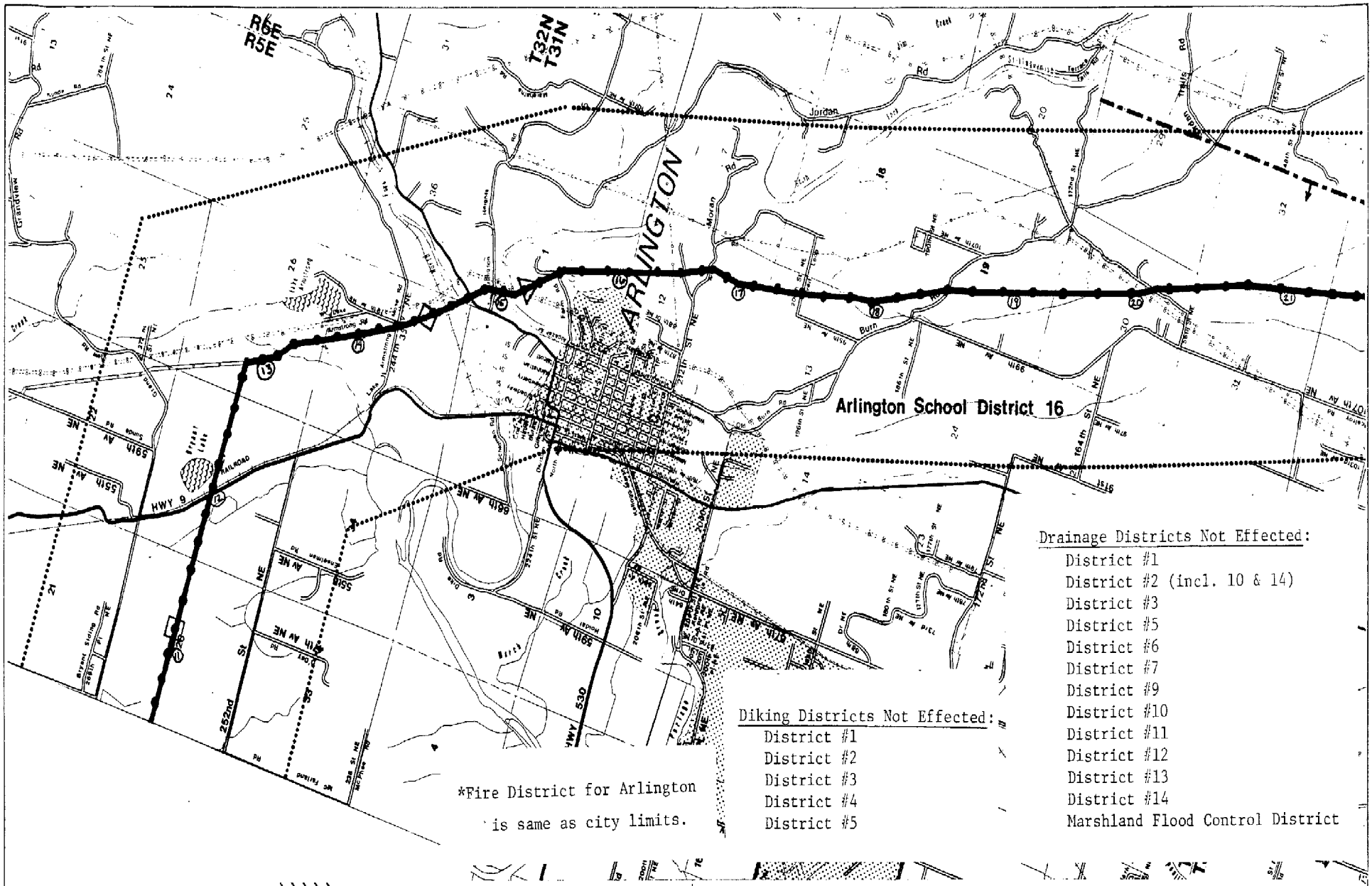
APPENDIX D: Maps

Sheet Number	Information
I - 5	Municipal and Special purpose districts within pipeline corridor.
6 - 10	Areas of Potential Liquifaction, and Settlement, and All Stream Crossings.



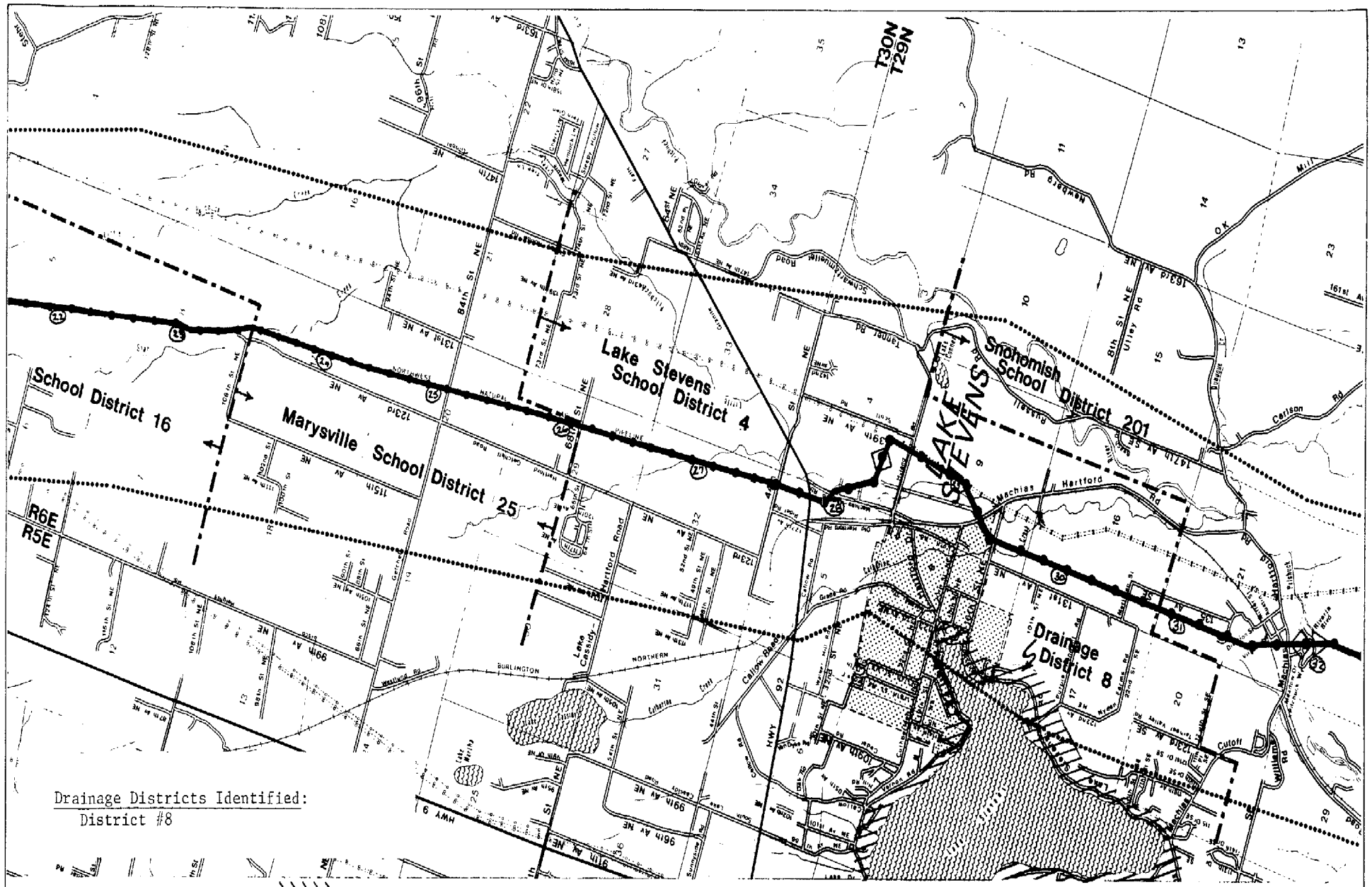
SNOHOMISH CO., WA

NORTHERN TIER STATISTICAL NOTEBOOK - Sheet 1



SNOHOMISH CO., WA

NORTHERN TIER STATISTICAL NOTEBOOK - Sheet 2



City Boundary
Fire Dist. Bdy.
School Dist. Bdy.
Hospital Dist.
Sewer Dist. Bdy.
Drainage Dist.
Flood Control Dist.
Lakes
mile marker
pump sta., block valve, ck. valve

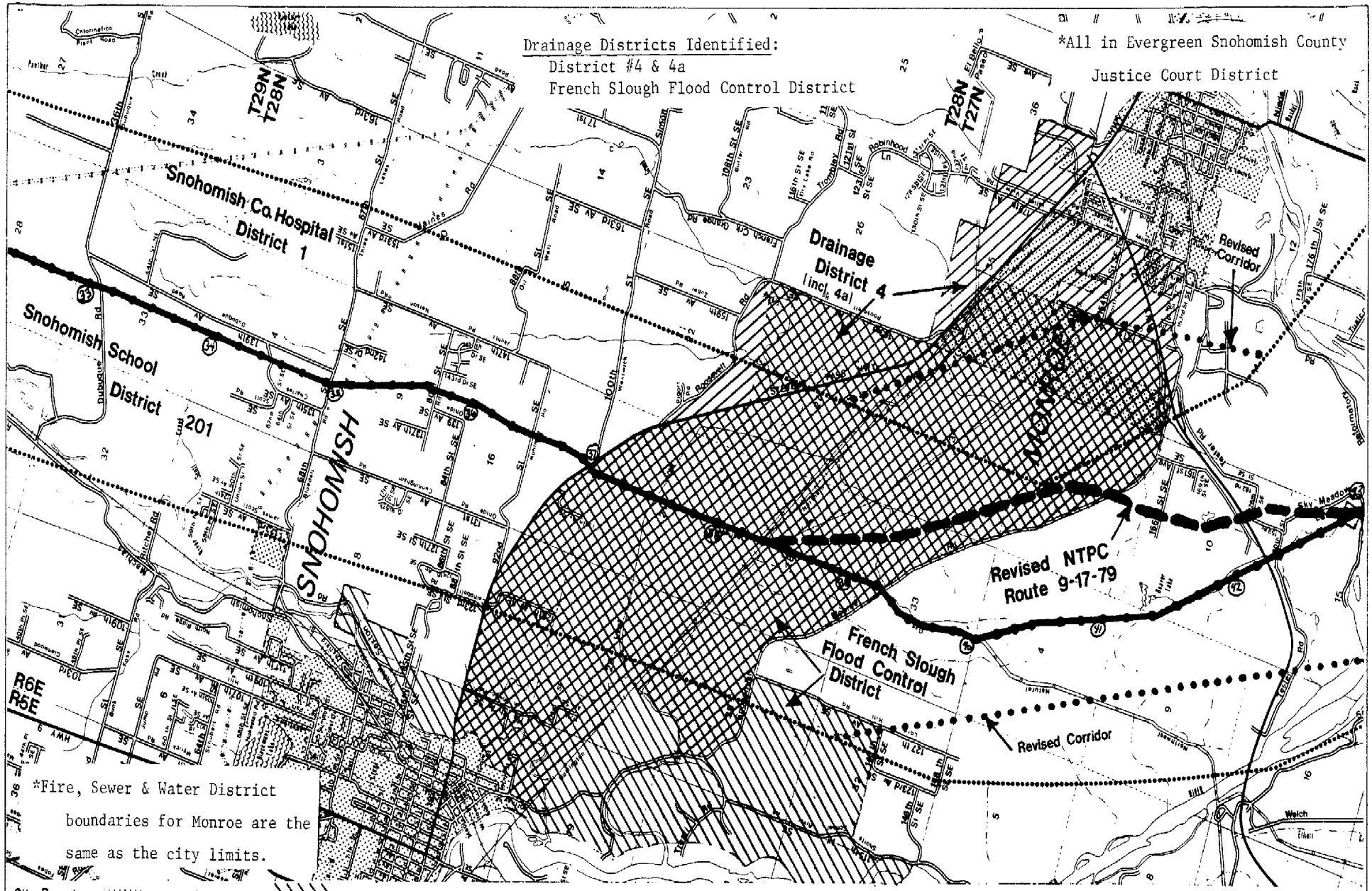
NORTH

SCALE
0 1 mile
0 1 kilometer

Pipeline
Corridor

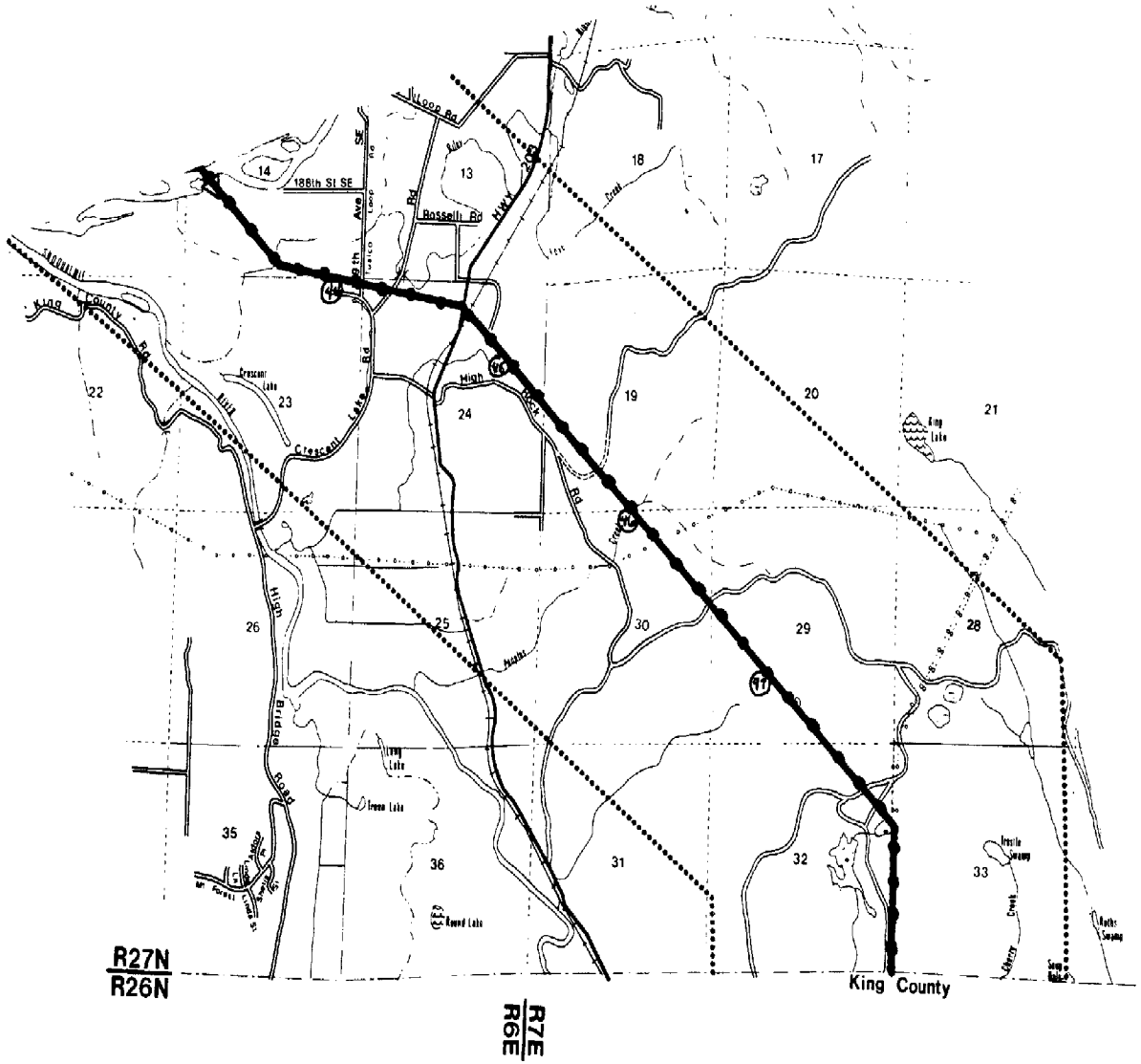
SNOHOMISH CO., WA

NORTHERN TIER STATISTICAL NOTEBOOK - Sheet 3



SNOHOMISH CO, WA

NORTHERN TIER STATISTICAL NOTEBOOK - Sheet 4



City Boundary
Fire Dist. Bdy.
School Dist. Bdy.
Hospital Dist.
Sewer Dist. Bdy.
Drainage Dist.
Flood Control Dist.
Lakes
mile marker
pump sta., block valve, ck. valve

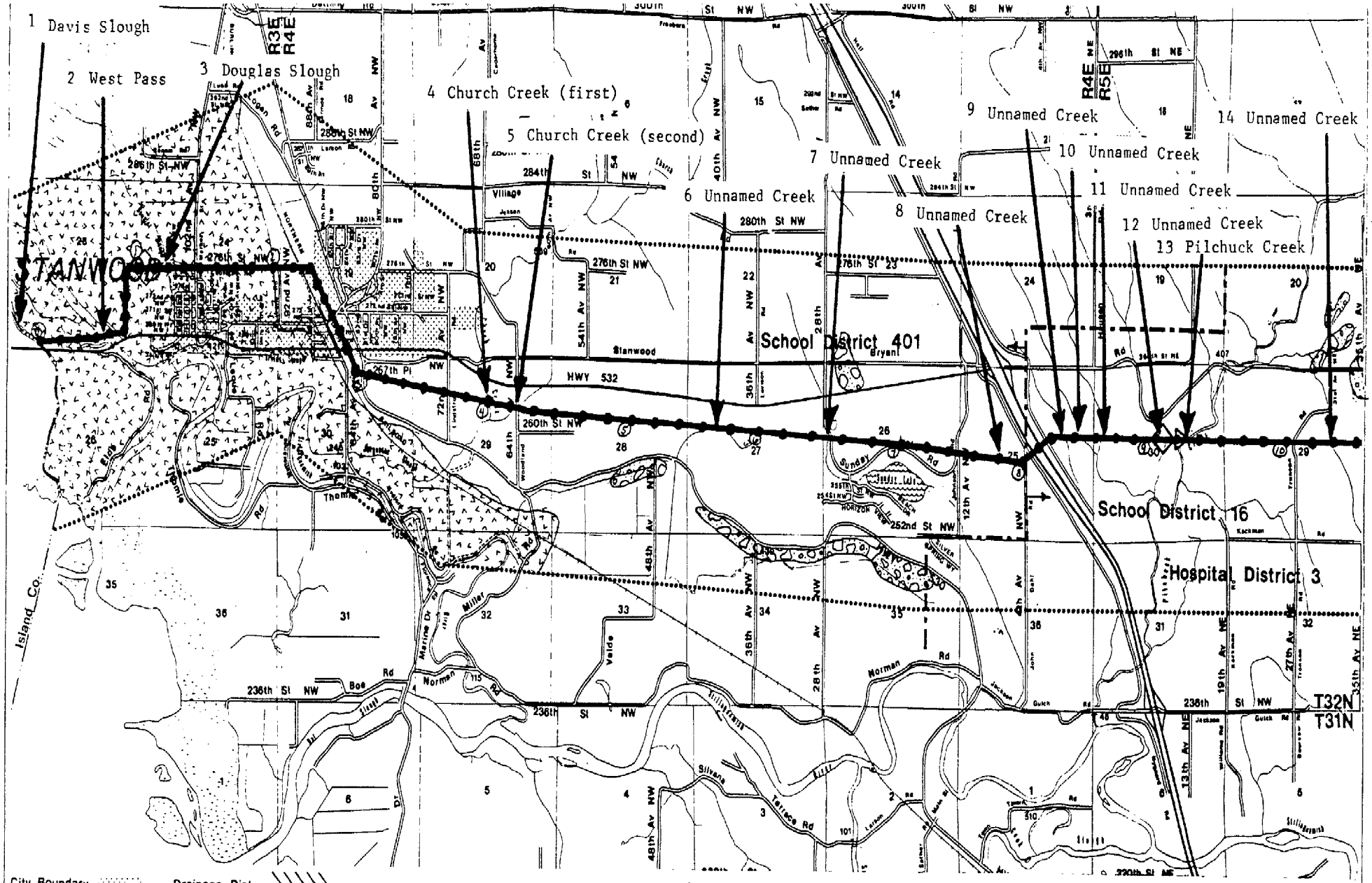
NORTH

SCALE
0 1 mile
0 1 kilometer

Pipeline
Corridor

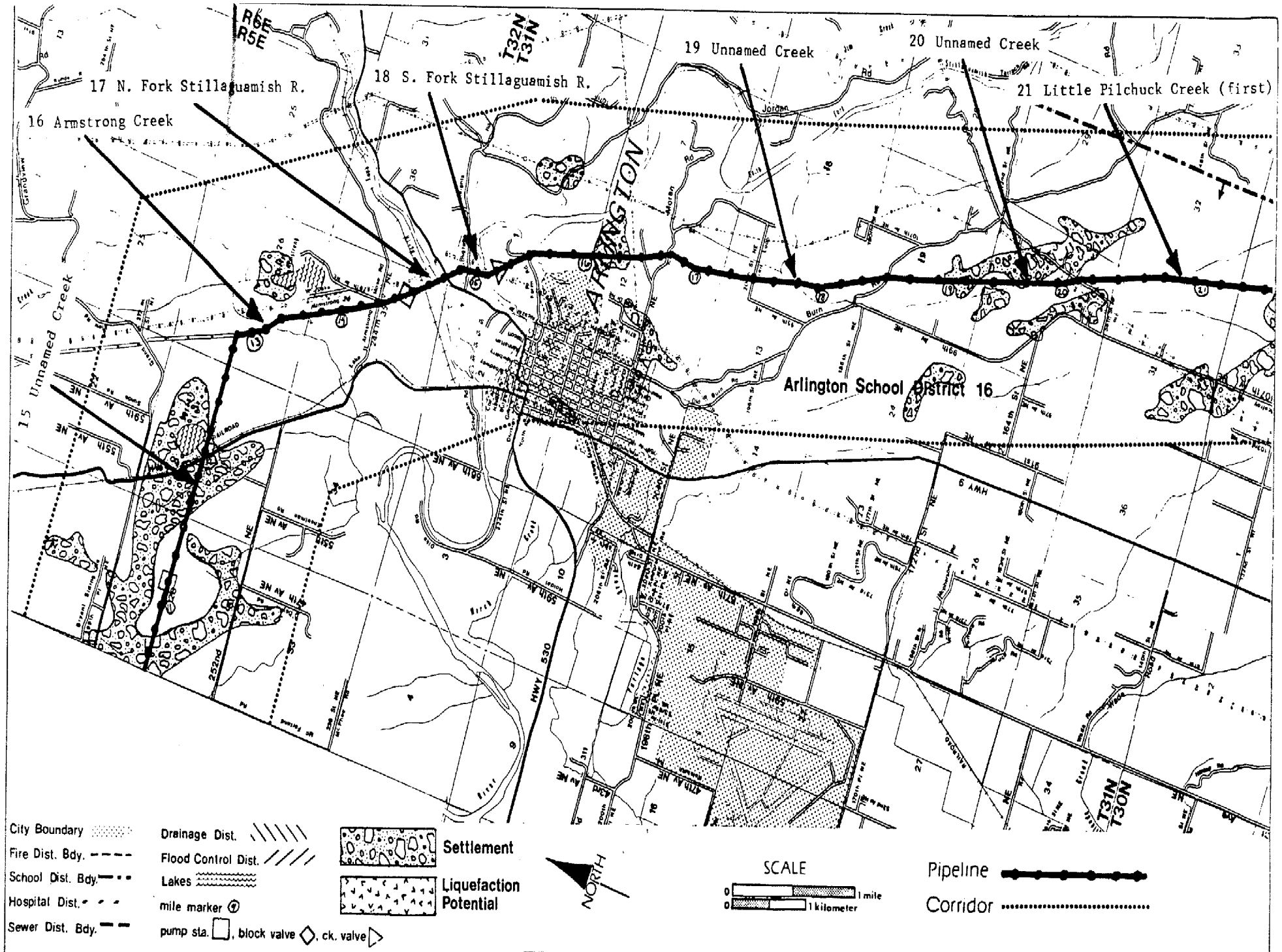
SNOHOMISH CO., WA

NORTHERN TIER STATISTICAL NOTEBOOK - Sheet 5



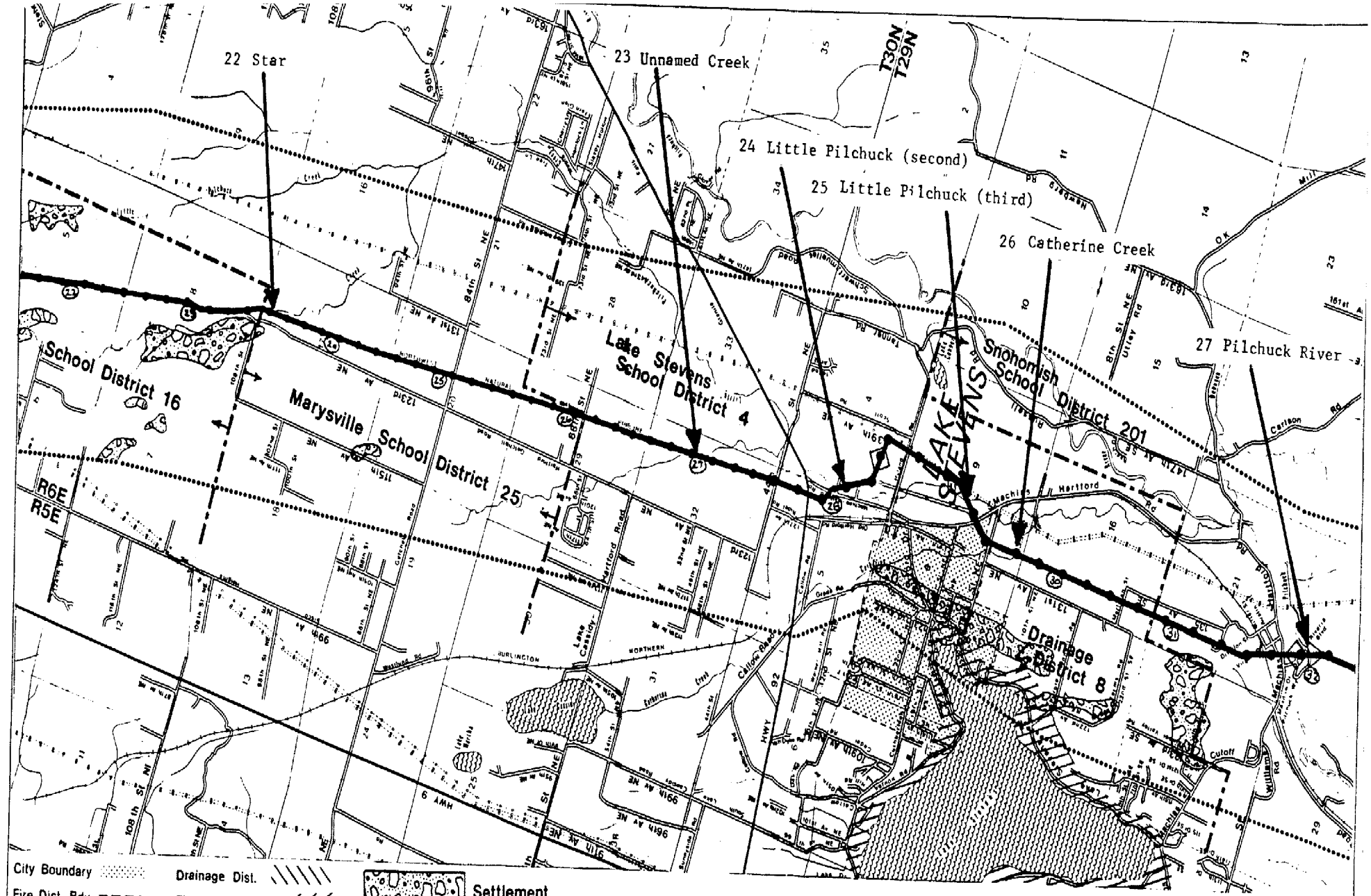
SNOHOMISH CO., WA

NORTHERN TIER STATISTICAL NOTEBOOK - Sheet 6



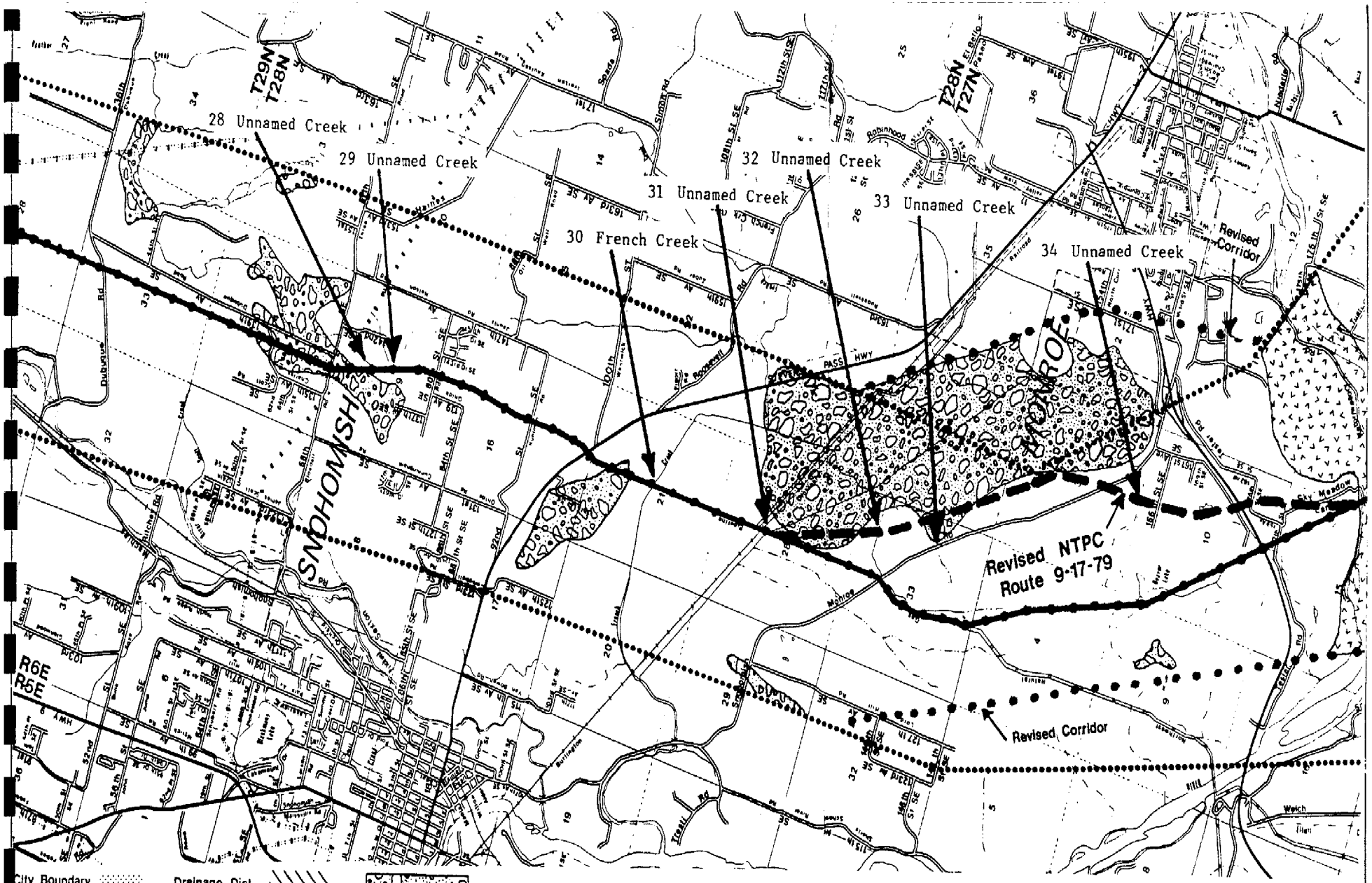
SNOHOMISH CO., WA

NORTHERN TIER STATISTICAL NOTEBOOK - **Sheet 7**

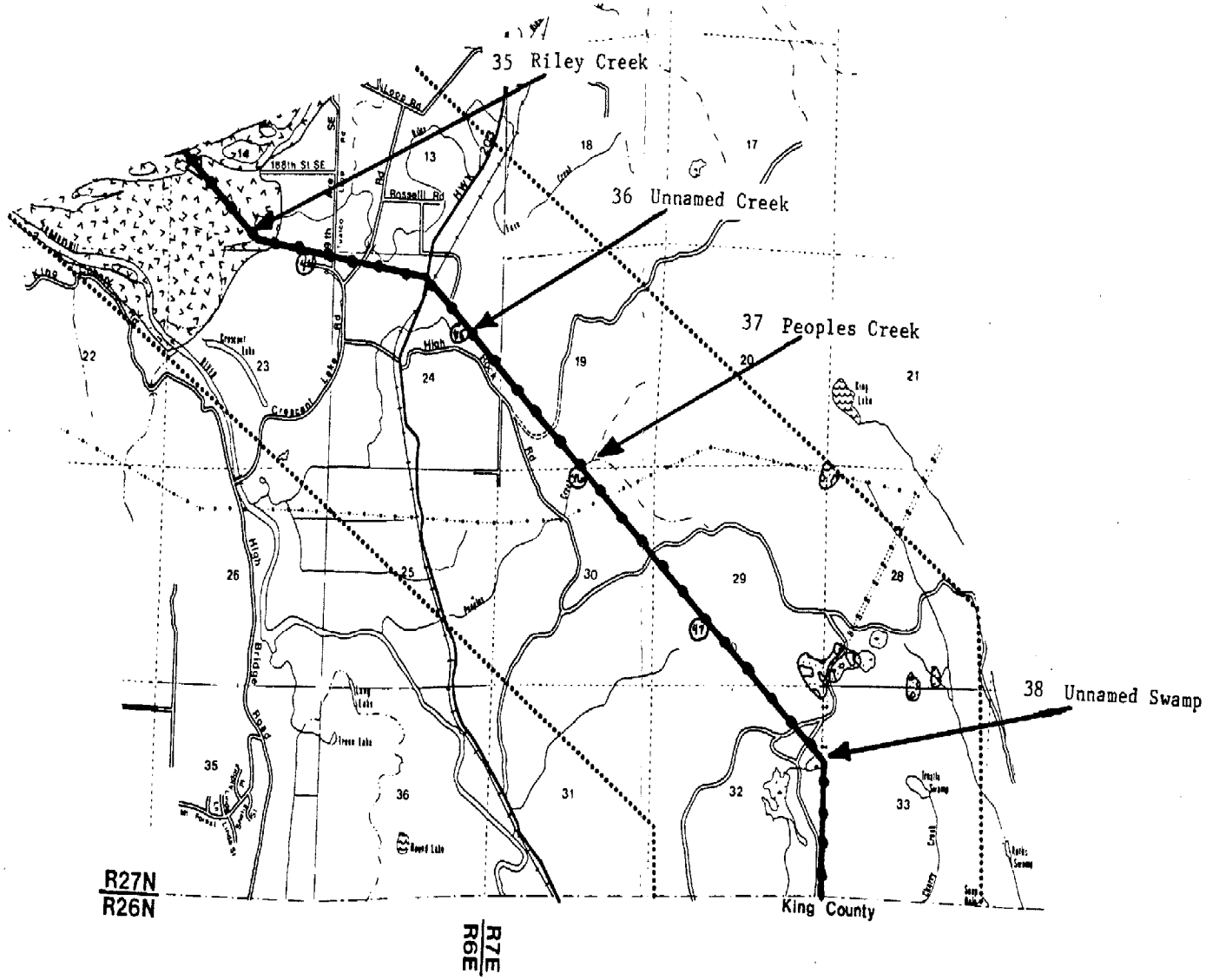


SNOHOMISH CO., WA

NORTHERN TIER STATISTICAL NOTEBOOK - Sheet 8



SNOHOMISH CO., WA — NORTHERN TIER STATISTICAL NOTEBOOK - **Sheet 9**



City Boundary
Fire Dist. Bdy.
School Dist. Bdy.
Hospital Dist.
Sewer Dist. Bdy.

Drainage Dist.
Flood Control Dist.
Lakes
mile marker
pump sta., block valve, ck. valve

Settlement
Liquefaction Potential

NORTH

SCALE
0 1 mile
0 1 kilometer

Pipeline
Corridor

SNOHOMISH CO, WA

NORTHERN TIER STATISTICAL NOTEBOOK - **Sheet 10**

NOAA COASTAL SERVICES CENTER LIBRARY
3 6668 14107 5483